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ARMY
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TM 11-6625-3024-14
EE641-AC-MMA-010/E154 SYSEX
TO 33AA50-5-1-1

TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

TEST SET, MAGNETIC TAPE TRANSPORT TS-4002/UYH-5 (NSN 6625-01-128-2432)

DEPARTMENTS OF THE ARMY, NAVY, AND AIR FORCE

FEBRUARY 1983

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SAFETY PRECAUTIONS

Before Operation

Be sure there are no open flames that may ignite the fuel vapors while the fuel tanks is being filled. Keep the container and funnel in contact with the tank being filled or provide a ground to prevent a static from igniting the fuel vapors.

Place adequate blocking under push beams before attempting to change the cutting edge or end bits, and while changing oil in the hydraulic system.

Never attempt to lift a heavy component without an adequate lifting device.

Do not attempt to weld a fuel tank unless the tank has been thoroughly flushed or filled with water to eliminate combustible vapors.

Do not tow tractor faster than 2 mph or farther than 1 mile, and then only when no other means of recovery are available.

During Operation

Always correct or report any faulty conditions that may result in further damage to the tractor or cause injury to personnel.

Never wipe, oil, refuel, or adjust any part of the tractor while the engine is in operation except for designated adjustments that must be made with the engine operating.

To prevent serious burns from live steam use extreme caution in releasing the radiator cap when engine has been overheated. If time permits, stop the engine, let cool before removing cap.

In severe cold weather, do not touch any metal parts of the tractor with the flesh. The flesh could stick and incur a severe frost injury.

Do not turn disconnect switch off while engine is operating.

After Operation

Before leaving the tractor, lower dozer blade to ground (control lever in float position), place the range selector lever in NEUTRAL START position and lock with the safety lever.

Ventilate area well after using the fire extinguisher to eliminate the fumes. They are toxic and deadly poison.

Never leave a heavy component or assembly in an unstable position that could result in the component or assembly falling on personnel.

Do not tow tractor faster than 2 mph or farther than 1 mile, and then only when no other means of recovery are available.

A CAREFUL OPERATOR IS THE BEST INSURANCE AGAINST AN ACCIDENT.

SUMMARY OF WARNINGS AND CAUTIONS

WARNING

When connecting the AC power cord to the line, be certain that the round safety grounding pin of the three-prong plug is connected to a good ground source. Do not attempt to operate the Exerciser with an adapter that disconnects this safety ground.

WARNING

The transport current test jacks are at +28 Vdc potential with respect to ground.

WARNING

Disconnect the AC line cord, transport power and signal cables prior to performing any removal or replacement procedures.

WARNING

Fumes of TRICHLOROTRIFLUOROETHANE are poisonous. Provide adequate ventilation whenever you use TRICHLOROTRIFLUOROETHANE.
Do not use solvent near heat or open flame. TRICHLOROTRIFLUOROETHANE will not burn, but heat changes the gas into poisonous, irritating fumes.
DO NOT breathe the fumes or vapors.
TRICHLOROTRIFLUOROETHANE dissolves natural skin oils. DO NOT get the solvent on your skin. Use gloves, sleeves and an apron which the solvent cannot penetrate. If the solvent is taken internally, see a doctor immediately.

WARNING

Compressed air shall not be used for cleaning purposes except where reduced to less than 29 pounds per square inch (psi) and then only with effective chip guarding and personnel protective equipment. Do not use compressed air to dry parts when TRICHLOROTRIFLUOROETHANE has been used. Compressed air is dangerous and can cause serious bodily harm if protective means or methods are not observed to prevent chip or particle (of whatever size) from being blown into the eyes or unbroken skin of the operator or other personnel.

WARNING

HIGH VOLTAGE

High voltage is used in this equipment. Be careful when working near the interior of the equipment, or near the ac power distribution. Observe warning notes in this technical manual and warning decals on equipment. Death on contact may result if safety precautions are not observed.

CAUTION

Do not place objects over the top or behind the Exerciser cabinet. Failure to observe this caution will cause obstruction of the air flow and overheat the Exerciser. Ensure that the blower fan is operating when SYSTEM POWER switch is turned ON. Refer to Section V if blower fan does not operate.

CAUTION

Never operate Exerciser with a lamp missing from a socket.

TM 11-6625-3024-14
EE641-AC-MMA-010/E154 SYSEX
TO 33AA50-5-1-1

TECHNICAL MANUAL
NO. 11-6625-3024-14
EE641-AC-MMA-010/E154 SYSEX
TECHNICAL ORDER
TO 33AA50-5-1-1

DEPARTMENTS OF THE ARMY
THE NAVY, AND
THE AIR FORCE

Washington, DC, 17 February 1983

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

TEST SET, MAGNETIC TAPE TRANSPORT TS-4002/UYH-5 (NSN 6625-01-128-2432)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of this manual direct to: Commander, US Army Communications – Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, New Jersey 07703.

For Air Force, submit AFTO Form 22 (Technical Order System Publication Improvement Report and Reply) in accordance with paragraph 6-5, Section VI, T.O. 00-5-1. Forward direct to prime ALC/MST.

For Navy, mail comments to the Commander, Naval Electronics Systems Command, ATTN: ELEX 8122, Washington, DC 20360.

In either case, a reply will be furnished direct to you.

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SECTION I
GENERAL DESCRIPTION

1-A.1. SCOPE

This manual describes the Test Set, Magnetic Tape Transport TS-4002/UYH-5 (Figure 1-1), hereafter referred to as the Exerciser. The manual contains instructions for the installation, operation, functional description and maintenance of the equipment. A complete listing of reference publications is provided in Appendix A. The Maintenance Allocation Chart is contained in Appendix B. The Repair Parts and Special Tools List (RPSTL) is contained in TM 11-5835-250-24P.

1-A.2. INDEX OF TECHNICAL PUBLICATIONS

a. Army. Refer to the latest issue of DA Pam 310-1 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. Air Force. Use T.O. 0-1-31 Series Numerical Index and Requirements Table (NIRT).

1-A.3. MAINTENANCE FORMS, RECORDS AND REPORTS

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System (Army). Air Force personnel will use AFR 66-1 for maintenance reporting and TO-00-35D54 for unsatisfactory equipment reporting. Navy personnel will report maintenance performed utilizing the Maintenance Data Collection Subsystem (MDCS) IAW OPNAVINST 4790.2, Vol 3 and unsatisfactory material/conditions (UR submissions) IAW OPNAVINST 4790.2, Vol 2, chapter 17.

b. Report of Packaging and Handling Deficiencies. Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR4140.55/NAVMATINST 4355.73/AFR 400-54/MCO 4430.3E.

c. Discrepancy in Shipment Report (DISREP) (SF361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF361) as prescribed in AR 55-38/NAVSUPINST 4610.33B/AFR 75-18/MCO P4610.19C and DLAR 4500.15.

1-A.4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

a. Army. If your Exerciser needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Tell us why a procedure is hard to perform. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications – Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, NJ 07703. We'll send you a reply.

b. Air Force. Air Force personnel are encouraged to submit EIR's in accordance with AFM 900-4.

c. Navy. Navy personnel are encouraged to submit EIR's through their local Beneficial Suggestion Program.

1-A.5. ADMINISTRATIVE STORAGE

Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage, the PMCS should be performed to assure operational readiness. Prepare in accordance with TM-740-90-1.

1-A.6. DESTRUCTION OF ARMY ELECTRONICS MATERIEL

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

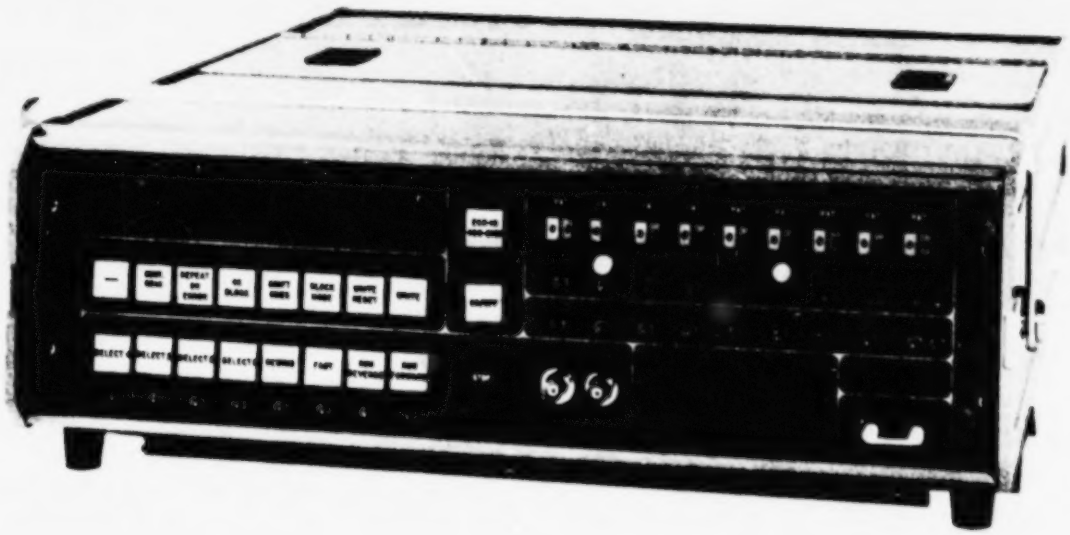


Figure 1-1. Magnetic Tape Transport Test Set TS-4002/UYH-5

1-1. INTRODUCTION

This technical manual provides installation, operation, and field level maintenance instructions for the TS-4002/UYH-5 Exerciser. Information contained in this manual is intended for use by technical personnel involved in the actual operation and maintenance of the subject equipment.

1-2. PURPOSE AND USE

The instructions contained in this manual apply to the Exerciser to be used in exercising the Magnetic Tape Transport AN/UYH-5.

1-3. EQUIPMENT DESCRIPTION

The Exerciser is a portable instrument designed to be a testing and troubleshooting aid for the AN/UYH-5 Magnetic Tape Transport. The Exerciser includes all the controls required to exercise the transport in both read and write modes. The unit is a portable, self-contained instrument that provides all data, control signals, and power required by the AN/UYH-5 transport.

Operator controls, indicators, and test points are located on the front panel. Test points are provided on the front panel for monitoring status indications from the transport, read and write data to and from the transport, and motion control signals to the transport.

The Exerciser generates a selected data pattern for recording on eight data channels and a parity channel. Front panel controls are provided for selecting ALL '0', ALL '1', or ALL PATTERN for write data on all eight channels. Write data is also selectable for each individual data channel. Front panel controls and indicators are provided for selecting write data in block mode, 256 byte block (short block), 4K byte block mode (long block), and shifted ones mode. The Exerciser will read the data from the transport in the recorded block mode and in a continuous read mode.

BNC connectors are provided on the front panel for external start enable inputs and start output pulses. Connectors are also provided on the front panel for monitoring the transport power supply current, data and control signals.

The Exerciser monitors the reproduced data from the transport for parity errors. Soft errors and hard errors are accumulated and displayed on 2-digit LED displays. The type of error (VRC error or LRC error) is also displayed on front panel indicators.

The Exerciser generates and formats nine read/write channels of parallel digital data in NRZ format. The Exerciser control logic controls the timing for the transport.

The Exerciser is housed in a sturdy metal case 6¼ inches high, 18 inches wide, and 23 inches deep. The power supply is separately housed and attached to the rear of the Exerciser mainframe. All front panel controls, indicators, and test points are an integral part of the logic printed circuit cards. Six printed circuit cards, containing all logic circuits, are located behind the front panel plate.

Cable storage is provided in a compartment located above the power supply module. One power cable and one transport interconnect cable povide interface between the Exerciser and transport.

1-4. EQUIPMENT SUPPLIED

The following items are included with the Exerciser:

Description	Part Number
Transport Signal/Control Cable	1000-564
Transport Power Cable	1000-566
Exerciser Power Cable	1000-552

1-5. EQUIPMENT SPECIFICATIONS

Equipment specifications and performance characteristics are listed in Table 1-1.

A list of recommended spare parts is shown in Table 1-2.

Table 1-1. Specifications and Performance Characteristics

Item	Characteristic and Specification
Size	6¼H x 18W x 23D
Weight	46 pounds
Input Power Requirement	115 Vac, 60 Hz, at 5 amps, single phase
Output Voltage (to transport)	28 ± 4 Vdc
Temperature	Operating: 0°C to +50°C
Write Data Format	9 tracks parallel (NRZ) (tracks 0 through 7 and parity track)
Clock Rate	50 microseconds = >888 BPI at 25 ips
Start/Stop Delay Time	43 milliseconds
External Start	>2.5 Vdc or open
Sync Pulse	Positive pulse
Status Indicators	EOT, BOT, IN REWIND, READY, SELECTED, WRITE ENABLE
Data Controls	CONT. READ, REPEAT ON ERROR, 4K BLOCK, SHIFT ONES, BLOCK MODE, WRITE, WRITE RESET
Motion Controls	SELECT 1, 2, 3, 4, REWIND, FAST, RUN REVERSE, RUN FORWARD

Table 1-2. Recommended Spares List

Item	Part Number	Quantity
Fuse	313005 (75915)	5
Fuse	313004 (75915)	5
Fuse	313003 (75915)	5
Lamp	LA64 (16845)	25
Lamp	335 (71744)	5
Power Supply	1000-401 (16845)	1
Circuit Card No. 1	1000-483 (16845)	1
Circuit Card No. 2	1000-492 (16845)	1
Circuit Card No. 3	1000-497 (16845)	1
Circuit Card No. 4	1000-493 (16845)	1
Circuit Card No. 5	1000-506 (16845)	1
Circuit Card No. 6	1000-516 (16845)	1
Power Switch	01-748230 (16845)	1
Power Switch	01-748510 (16845)	1
Test Point Bracket Assembly	1000-514 (16845)	1
Current Sense Probe Assembly	1000-531 (16845)	2
Blower Assembly	1000-452 (16845)	1

SECTION II
INSTALLATION

2-1. INTRODUCTION

This section describes unpacking and installation steps required to operate the Exerciser. The Exerciser is a portable instrument designed for table top operation. No special tools are required for installation.

2-2. UNPACKING

The Exerciser is packed for shipment in accordance with standard commercial practice for shipment by air freight, rail, or truck.

The Exerciser is precision-made and care should be taken not to drop it, or subject it to severe handling. Carefully remove the instrument from the shipping container and check against the packing slip for shortages or damages.

2-3. PREPARATION FOR USE. (Figure 1-1)

Normal installation consists of setting the Exerciser in a horizontal position on a bench, table, or cart. The Exerciser has a built-in blower for internal cooling. Care should be taken to provide ample ventilation to the instrument.

The following procedures describe preparations for operating the Exerciser.

1. Set the Exerciser on an appropriate bench, table, or cart in its standing (vertical) position.

2. Open the bottom access cover to the cable storage compartment. To open the access cover, slide the two latches down.

Remove the power cable and the two transport interconnecting cables. Close the access cover.

3. Set the Exerciser in a horizontal position on its bottom feet. Fold the carrying handle upward. Release the two side clips to open the front cover and open the front cover.

4. Lift the Exerciser by the carrying handle and fold the cover back under the Exerciser. Set the Exerciser back down on its bottom feet and fold the carrying handle down.

5. Open the top access cover to the output connector panel. To open the access cover, slide the two latches toward the rear of the Exerciser.

6. Attach the transport signal/control cable P1 and P2 (P/N 1000-564) to connectors J1 and J2 of the Exerciser as shown in Figure 2-1. See Figure 3-2 for connector location.

Note

Connectors J1 and J2 of the Exerciser are keyed to prevent accidental insertion of P1 into J2, or P2 into J1.

7. Attach the transport power cable P1 (P/N 1000-566) to connector J3 of the Exerciser as shown in Figure 2-1.

8. Insert the Exerciser power cable into the power socket located at the rear of the Exerciser. Plug the power cable into 115 Vac, 60 Hz power source as shown in Figure 2-1.

WARNING

When connecting the AC power cord to the line, be certain that the round safety grounding pin of the three-prong plug is connected to a good ground source. Do not attempt to operate the Exerciser with an adapter that disconnects this safety ground.

CAUTION

Do not place objects over the top or behind the Exerciser cabinet. Failure to observe this caution will cause obstruction of air flow and overheat the Exerciser. Ensure that blower fan is operating when system power switch is turned on. Refer to Section V if blower fan does not operate.

CAUTION

Do not turn on power without first checking to ensure that no indicator lamps are missing from socket. Burnout of transistor driver will occur if lamp is missing.

9. Press the front panel SYSTEM ON/OFF switch to turn power on.

10. Press the PROCESSOR RESET switch located on the top connector panel (Figure 3-2). Verify that all front panel indicators are extinguished, except SYSTEM ON/OFF power switch, STOP switch, WRITE RESET, Data Select indicators, and Error indicators.

CAUTION

If any lamps do not light, turn power OFF immediately, to prevent equipment damage. Do not replace lamp with power on. Transistor driver burnout will occur.

11. Press the LAMP TEST switch located on the top connector panel. Verify that all indicators light except TRANSPORT power switch (located above SYSTEM ON/off switch) and the nine write data indicator switches.

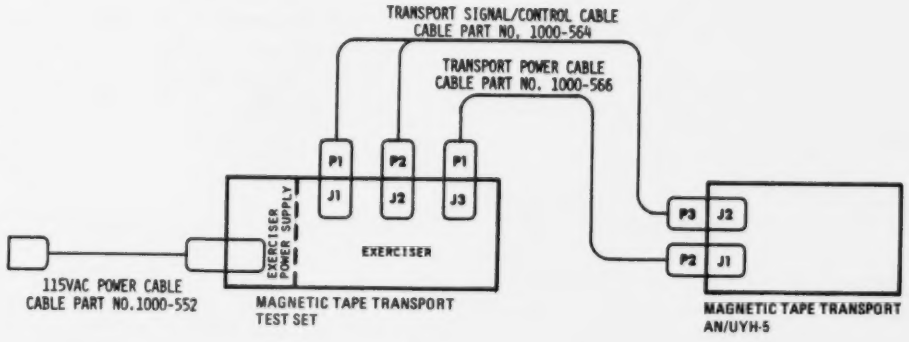
12. Ensure that the TRANSPORT ON/OFF indicator is extinguished. Press the SYSTEM ON/OFF switch to remove power from the Exerciser before connecting the interconnecting cables to the transport.

13. Attach transport signal/control cable P3 to J2 (see Figure 2-1) and transport power cable P2 to J1 on the Magnetic Tape Transport AN/UYH-5.

14. Insert tape in transport and close door.

2-4. ELECTRICAL CONNECTIONS

All electrical connections from the Exerciser to the transport are made from the connector panel. Figure 2-1 is the cabling diagram, Table 2-1 is a wire list for transport control cable (P/N 1000-564) and Table 2-2 is a wire list for the transport power cable (P/N 1000-566). Figure 2-2 shows the connector pin location.



Note: Reference Figure 3-2 for connector location.

Figure 2-1. Cable Connections

Table 2-1. Transport Signal/Control Cable Wire List (P/N 1000-564)

Cable Connector/Pin	Exerciser Signal Name	Cable Connector/Pin
P1 — A	Read Data Bit 2^0	P3-13
P1 — B	Read Data Bit 2^0 Return	P3-14
P1 — C	Read Data Bit 2^1	P3-17
P1 — D	Read Data Bit 2^1 Return	P3-18
P1 — E	Read Data Bit 2^2	P3- 9
P1 — F	Read Data Bit 2^2 Return	P3-10
P1 — G	Read Data Bit 2^3	P3- 1
P1 — H	Read Data Bit 2^3 Return	P3- 2
P1 — J	Read Data Bit 2^4	P3- 7
P1 — K	Read Data Bit 2^4 Return	P3- 8
P1 — L	Read Data Bit 2^5	P3- 5
P1 — M	Read Data Bit 2^5 Return	P3- 6
P1 — N	Read Data Bit 2^6	P3- 3
P1 — P	Read Data Bit 2^6 Return	P3- 4
P1 — R	Read Data Bit 2^7	P3-15
P1 — S	Read Data Bit 2^7 Return	P3-16
P1 — T	Read Data Parity	P3-11
P1 — U	Read Data Parity Return	P3-12
P1 — V	Read Data Clock	P3-19
P1 — W	Read Data Clock Return	P3-20
P1 — X	SELECT 3	P3-75
P1 — Y	SELECT 3 Return	P3-76
P1 — Z	SELECT 4	P3-77
P1 — a	SELECT 4 Return	P3-78
P1 — b	SELECT 1	P3-71
P1 — c	SELECT 1 Return	P3-72
P1 — d	SELECT 2	P3-73
P1 — e	SELECT 2 Return	P3-74

Table 2-1. Transport Control Cable Wire List (P/N 1000-564) (Continued)

Cable Connector/Pin	Exerciser Signal Name	Cable Connector/Pin
P1 — j	$\overline{\text{ON LINE}}$	P3-59
P1 — k	$\overline{\text{ON LINE}}$ Return	P3-60
P1 — m	$\overline{\text{EOT}}$	P3-65
P1 — n	$\overline{\text{EOT}}$ Return	P3-66
P1 — p	$\overline{\text{READY}}$	P3-61
P1 — q	$\overline{\text{READY}}$ Return	P3-62
P1 — r	$\overline{\text{IN REWIND}}$	P3-69
P1 — s	$\overline{\text{IN REWIND}}$ Return	P3-70
P1 — v	$\overline{\text{BOT}}$	P3-63
P1 — w	$\overline{\text{BOT}}$ Return	P3-64
P2 — C	$\overline{\text{WRITE}}$	P3-47
P2 — D	$\overline{\text{WRITE}}$ Return	P3-48
P2 — E	KEEP ALIVE	P3-49
P2 — F	KEEP ALIVE Return	P3-50
P2 — L	$\overline{\text{WRITE ENABLE}}$	P3-67
P2 — M	$\overline{\text{WRITE ENABLE}}$ Return	P3-68
P2 — N	Write Data Bit 2^0	P3-37
P2 — P	Write Data Bit 2^0 Return	P3-38
P2 — R	Write Data Bit 2^1	P3-41
P2 — S	Write Data Bit 2^1 Return	P3-42
P2 — T	Write Data Bit 2^2	P3-33
P2 — U	Write Data Bit 2^2 Return	P3-34
P2 — V	Write Data Bit 2^3	P3-25
P2 — W	Write Data Bit 2^3 Return	P3-26
P2 — X	Write Data Bit 2^4	P3-31
P2 — Y	Write Data Bit 2^4 Return	P3-32
P2 — Z	Write Data Bit 2^5	P3-29
P2 — a	Write Data Bit 2^5 Return	P3-30

Table 2-1. Transport Control Cable Wire List (P/N 1000-564) (Continued)

Cable Connector/Pin	Exerciser Signal Name	Cable Connector/Pin
P2 — b	Write Data Bit 2^6	P3-27
P2 — c	Write Data Bit 2^6 Return	P3-28
P2 — d	Write Data Bit 2^7	P3-39
P2 — e	Write Data Bit 2^7 Return	P3-40
P2 — f	Write Data Parity	P3-35
P2 — g	Write Data Parity Return	P3-36
P2 — h	Write Data Clock	P3-43
P2 — i	Write Data Clock Return	P3-44
P2 — j	WRITE RESET	P3-45
P2 — k	WRITE RESET Return	P3-46
P2 — m	$\overline{\text{FAST}}$	P3-55
P2 — n	$\overline{\text{FAST}}$ Return	P3-56
P2 — p	$\overline{\text{RUN FORWARD}}$	P3-53
P2 — q	$\overline{\text{RUN FORWARD}}$ Return	P3-54
P2 — r	$\overline{\text{RUN REVERSE}}$	P3-51
P2 — s	$\overline{\text{RUN REVERSE}}$ Return	P3-52
P2 — v	$\overline{\text{READ}}$	P3-21
P2 — w	$\overline{\text{READ}}$ Return	P3-22
P2 — FF	$\overline{\text{REWIND}}$	P3-57
P2 — GG	$\overline{\text{REWIND}}$ Return	P3-58

Table 2-2. Transport Power Cable Wire List (P/N 1000-566)

Cable Connector/Pin	Exerciser Signal Name	Cable Connector/Pin
P1 — A	+28 Vdc Transport	P2 — B
P1 — B	28V Return	P2 — C
P1 — C	Chassis Ground	P2 — A

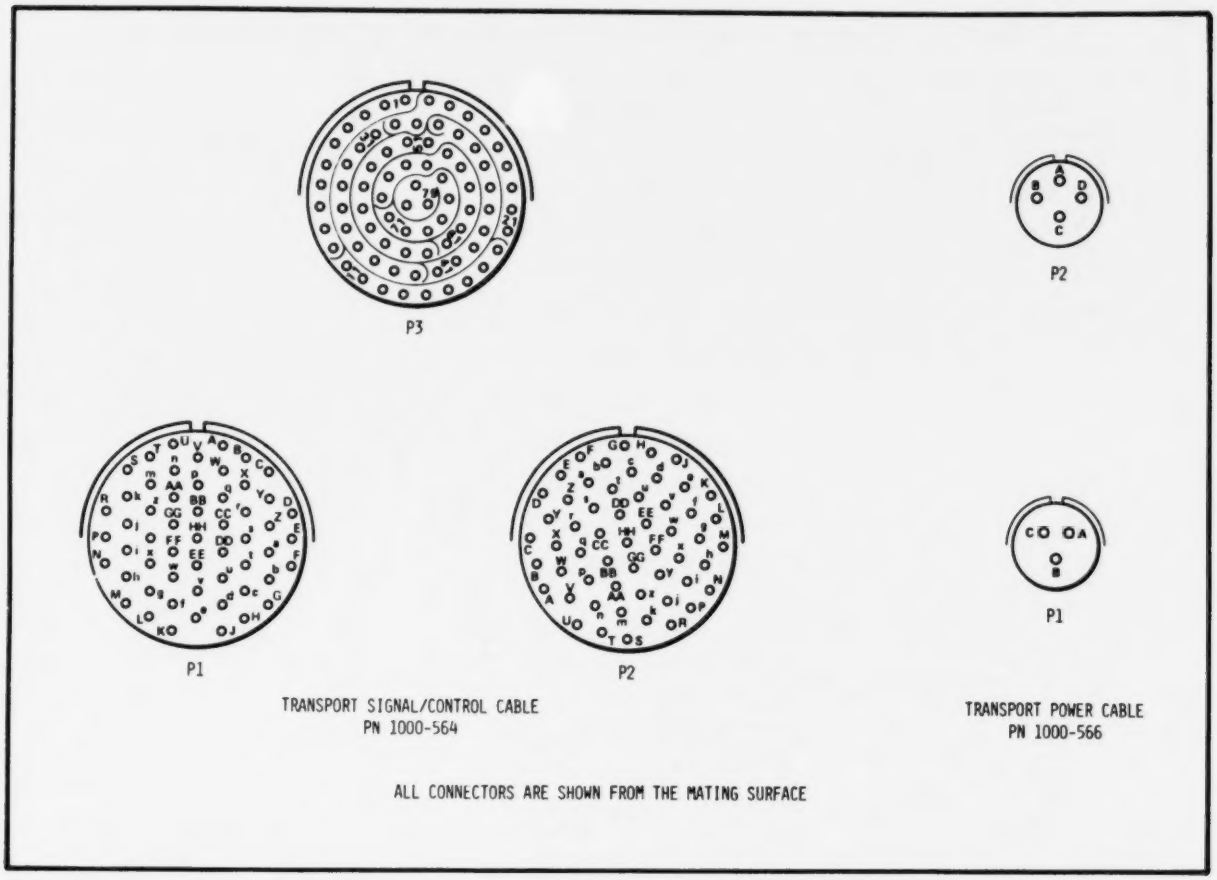


Figure 2-2. Connector Pin Location.

SECTION III
OPERATION

3-1. INTRODUCTION

This section provides complete operating instructions for the Exerciser. Instructions contained in this section are intended for use by technical personnel involved in the actual operation of the Exerciser.

3-2. CONTROLS AND INDICATORS

Controls and indicators required for routine operation are located on the front panel. Figure 3-1 shows the location of all front panel controls and indicators. Figure 3-2 shows the location of controls located on the connector panel. Figure 3-3 shows the location of the main fuse and the +5 Vdc system fuses. Tables 3-1, 3-2 and 3-3 list the controls and indicators, and describe their respective functions.

CAUTION

Do not place objects over the top or behind the Exerciser cabinet. Failure to observe this caution will cause obstruction of air flow and overheat the Exerciser. Ensure that blower fan is operating when system power switch is turned on. Refer to Section V if blower fan does not operate.

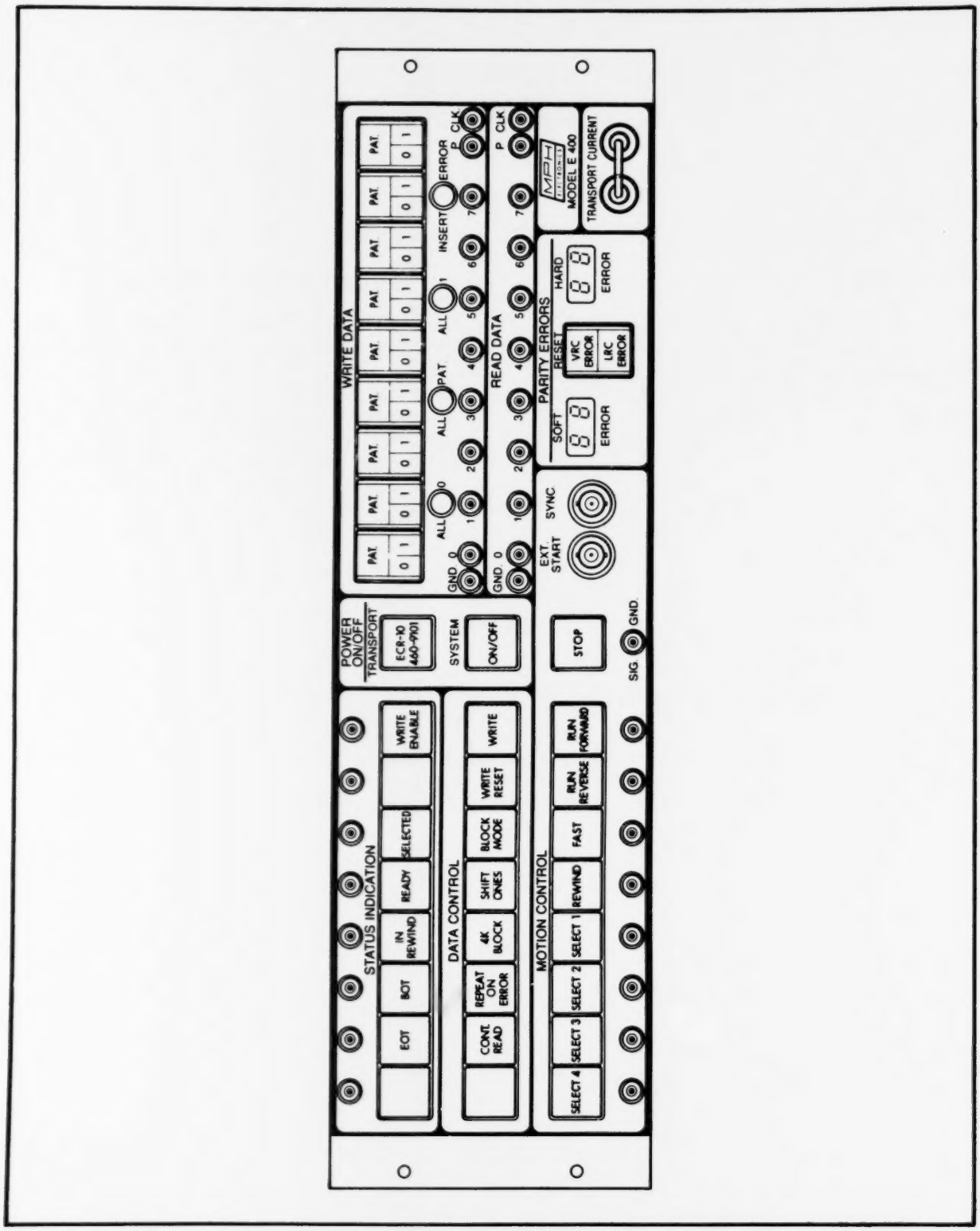


Figure 3-1. Front Panel Controls and Indicators

Table 3-1. Front Panel Controls and Indicators

Control/Indicator	Function
STATUS INDICATION	**Note** A test jack over each status indicator is provided to monitor each status line at the Exerciser input.
EOT	Indicates when the transport tape has reached END-OF-TAPE.
BOT	Indicates when the transport tape has been positioned at the BEGINNING-OF-TAPE.
IN REWIND	Indicates when the transport is in rewind mode.
READY	Indicates when the transport is ready to read or write data and all transport interlocks are closed.
SELECTED	Indicates when the transport and the Exerciser are set to the same select number (1 through 4).
WRITE ENABLE	Indicates when the transport tape cartridge is write enabled.
DATA CONTROL	**Note** All Data Controls except WRITE RESET are push-ON and push-OFF pushbutton switches. When the switch indicator is lit, the function is enabled (ON).
CONT. READ	Places the transport in continuous read mode when lit. When not used the read circuits are delayed 14 milliseconds after RUN FORWARD or RUN REVERSE is initiated.
REPEAT ON ERROR	Commands the Exerciser to repeat the recorded block in which an error has been detected. Three attempts are made to recover the detected error before a HARD ERROR is counted, and the original operation is resumed. Used only with the BLOCK MODE and 4K BLOCK mode switches.

Table 3-1. Front Panel Controls and Indicators (Continued)

Control/Indicator	Function
4K BLOCK	Selects either a short (256 bytes) or long (4096 bytes) block data when combined with BLOCK MODE, WRITE, and RUN FORWARD functions.
SHIFT ONES	Produces a byte of all ones, then a one in each subsequent track between the all ones byte. A sync pattern of 16 bits of one-zero, followed by 16 ones, is available from the parity track. Used only with WRITE, RUN FORWARD, and PAT. (pattern) functions. This function recommended for skew measurements.
BLOCK MODE	Produces the recorded data block length of 256 bytes, or 4096 bytes when 4K BLOCK has also been selected. Used only with WRITE and RUN FORWARD functions. Commands the Exerciser to step through blocks incrementally when the WRITE function is not selected, i.e., READ mode.
WRITE RESET	Indicates that a WRITE RESET command is sent to the transport when pushed or lit.
WRITE	Places the Exerciser and transport in a WRITE mode. A lighted WRITE indicator will cause new data to be written on tape, when the RUN FORWARD switch is enabled, providing the transport is write enabled. Blocks or continuous data may be selected in conjunction with the WRITE command. Each block is ended with a CRC and LRC word.

Table 3-1. Front Panel Controls and Indicators (Continued)

Control/Indicator	Function
MOTION CONTROL	**Note** 1. All Motion Controls are push-ON pushbutton switches. When the switch indicator is lit, the function is enabled (ON). 2. A test jack under each indicator is provided to monitor its corresponding function with the following exceptions: Test Jack under RUN FORWARD switch is used to monitor Forward Reverse commands. Test jack under RUN REVERSE switch is used to monitor Run Stop commands. SIG GND test jack located under STOP switch is used as return for all Motion Control and Status Indication test jack signals.
SELECT 1 through SELECT 4	Selects address of transport under test. The transport address select switch must be set to the same number selected on the Exerciser.
REWIND	Enables the transport REWIND operation. The indicator will be extinguished when the transport responds with a BOT status. The transport cannot be stopped until Beginning-Of-Tape (BOT) is reached. Transport will stop and BOT status indicator will light.
FAST	Enables the transport FAST tape motion in the commanded direction, when combined with the RUN FORWARD or RUN REVERSE motion switches. The FAST command excludes the WRITE operation.
RUN REVERSE	Commands REVERSE tape motion in the transport. The read circuits are enabled with motion. The WRITE indicator will be turned off by a reverse motion command. FAST tape motion may be combined with RUN REVERSE.

Table 3-1. Front Panel Controls and Indicators (Continued)

Control/Indicator	Function
RUN FORWARD	Commands FORWARD tape motion in the transport. The read circuits and the error counter are enabled with forward tape motion. FAST tape motion may be combined with RUN FORWARD.
STOP	Terminates all operations under control of the Exerciser. The REWIND operation cannot be stopped, once in progress. All Motion Control and Data Control switches are locked out when the STOP indicator is not lighted. (STOP function disabled).
SIG GND	Used as return for all Motion Control and Status Indication test jack signals.
EXT. START CONNECTOR	(Used with BLOCK MODE only.) Starts the next block operation when the voltage at the EXT. START input connector is above 2.5 Vdc or the input is open.
SYNC. CONNECTOR	(Used with BLOCK MODE only.) Provides a TTL output pulse (open collector) at the start of each block, when BLOCK MODE has been selected.
POWER ON/OFF	
SYSTEM ON/OFF	Exerciser power switch. Provides power to all Exerciser circuits. An automatic power reset sets the STOP and WRITE RESET indicators to ON. All other Data Control and Motion Control indicators are off.

Table 3-1. Front Panel Controls and Indicators (Continued)

Control/Indicator	Function
TRANSPORT ECR-10 460-9101	Provides +28 Vdc power to the transport. The Exerciser SYSTEM ON/OFF power switch must be ON before transport power can be enabled. **Note** A current sense loop or a 5 amp rated ammeter must be inserted in the TRANSPORT CURRENT jacks before transport power can be enabled.
WRITE DATA	**Note** The Write Data controls are push-ON and push-CHANGE, three-position pushbutton switches. The lighted portion of the switch indicator indicates the enabled function.
PAT. 0 1 (Indicator Switches)	Selects the write data to be written on tape. When PAT. (Pattern) is lighted a data pattern will be written on tape. When "0" is lighted a logic 0 will be written on tape. When "1" is lighted a logic 1 will be written on tape. The nine indicator switches provide write data selection for tracks 0 through 7 and Parity. A test jack under each indicator is provided to monitor each write data track, parity track, and the write data clock.
Gnd, 0 through 7, P and CLK Test Jacks	A test jack is provided under each PAT./ 0 / 1 indicator to monitor each write data track, parity track and the write data clock. The GND test jack is used as return for all write data test jacks.
ALL 0 Switch (white)	Selects all tracks at once (except parity track) to logic 0 write data. The white portion (0) of the WRITE DATA indicators for all tracks (except parity track) will light.

Table 3-1. Front Panel Controls and Indicators (Continued)

Control/Indicator	Function
ALL PAT. Switch (blue)	Selects all tracks at once to PATTERN write data. The blue portion (PAT.) of WRITE DATA indicators for all tracks will light.
ALL 1 Switch (yellow)	Selects all tracks at once to logic 1 write data. The yellow portion (1) of the WRITE DATA indicators for all tracks will light.
INSERT ERROR Switch (red)	Inserts error by inverting parity bit for one clock time each time switch is pressed. Button must be pushed while data is being written to induce an error in PAT. mode only.
READ DATA	
Gnd, 0 through 7, P and CLK Test Jacks	The returned READ DATA for tracks 0 through 7, Parity track, and Read Clock are available at the test jacks. The GND test jack is used as return for all read data test jacks.
PARITY ERRORS	
SOFT ERROR Digital Display	Displays all parity errors counted in the read mode.
HARD ERROR Digital Display	Displays the errors detected by the Exerciser central processor when REPEAT ON ERROR mode is used. (The central processor commands all errors to be evaluated three times.) The error is reported as a HARD ERROR if the error exists after three evaluation cycles with REPEAT ON ERROR function.
VRC ERROR Indicator	(Vertical Redundancy Check) indicates when any parity error is detected. Indicator will remain lit until reset.
LRC ERROR Indicator	Indicates when any Longitudinal Redundancy Check (LRC) error is detected. Indicator will remain lit until reset.
RESET Pushbutton Switch	Resets the VRC ERROR and LRC ERROR indicators, SOFT ERROR counter and display, and HARD ERROR counter and display, when pressed.

Table 3-1. Front Panel Controls and Indicators (Continued)

Control/Indicator	Function
TRANSPORT CURRENT	WARNING The Transport Current test jacks are at +28 Vdc potential with respect to ground.
Test Jacks	The test jacks are connected in series with the transport +28 Vdc power supply and are provided to monitor transport current measurements. The Current Sense Loop or an ammeter must be inserted for the +28 Vdc to be present at the transport power connector.

Table 3-2. Connector Panel Controls

Control/Indicator	Function
F1 Fuse	+28 Vdc transport power fuse. (5 amp SLO-BLOW)
F2 Fuse	+28 Vdc Exerciser lamps fuse. (3 amp SLO-BLOW) **Note** Fuse F2 does not protect lamps for transport power switch, system power switch, and STOP switch.
LAMP TEST Switch	Lights all Exerciser indicator lamps, including the PARITY ERROR LED display indicators. The LAMP TEST switch will not light the Transport and System Power ON/OFF and the WRITE DATA indicators.
PROCESSOR RESET Switch	Resets all DATA CONTROL and MOTION CONTROL Indicators, except STOP and WRITE RESET indicators.

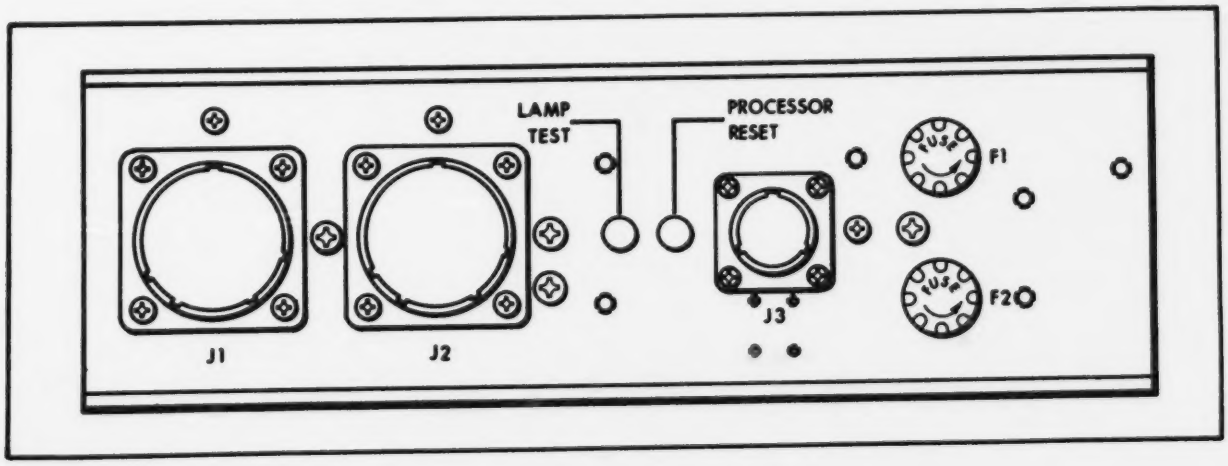
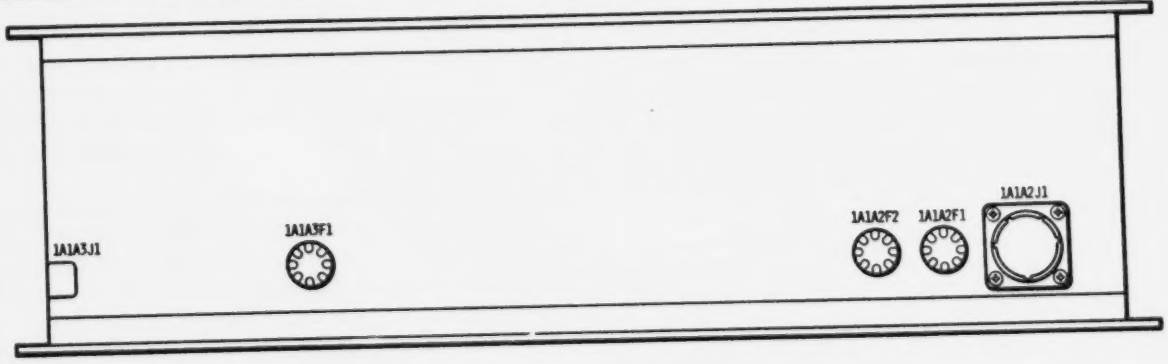


Figure 3-2. Connector Panel Controls

Table 3-3. Power Supply Fuses

Control/Indicator	Function
1A1A3F1 Fuse	Main System fuse, 115 Vac input. (5 amp SLO-BLOW)
1A1A2F1 Fuse	+5 Vdc #1 overvoltage circuit protection. (4 amp SLO-BLOW)
1A1A2F2 Fuse	+5 Vdc #2 overvoltage circuit protection. (4 amp SLO/BLOW)



NOTE: Reference Figure 5-3 for location on power supply.

Figure 3-3. Power Supply Fuses and Connectors.

3-3. OPERATING PROCEDURES

Operating procedures for the Exerciser assume that Installation and Preparation for Use, as defined in Section II of this manual, have been completed. It also assumes that the transport is functioning properly. These procedures include all steps necessary to bring the Exerciser from OFF through standby to full operation, and from full operation through standby to OFF.

The operating procedure will vary according to the user's requirements. The following is a general operating procedure intended to inform the operator of the general method of operating the Exerciser.

CAUTION

Do not turn on power without first checking to ensure that no indicator lamps are missing from socket. Burnout of transistor driver will occur if lamp is missing. Refer to paragraph 5-12 for replacement.

Note

All switch indicators are push-ON and push-OFF pushbutton switches. When the indicator is lit, the function is enabled (ON).

Note

Before operating, press the LAMP TEST switch located on the top connector panel. Verify that all indicators light except TRANSPORT power switch (located above SYSTEM ON/OFF switch) and the nine write data indicator switches.

3-4. STANDBY MODE

The Exerciser should be in the Standby mode prior to performing the functional checks described in the following paragraphs.

Note

The Exerciser is in standby when the following indicators are lit: BOT, READY, SELECTED, WRITE ENABLE, WRITE RESET, one MOTION CONTROL-SELECT indicator, POWER ON/OFF ECR-10 460-9101, ECR-10 460-9101, SYSTEM ON/OFF and STOP. Also the PARITY ERRORS – HARD and SOFT displays must be zeroes.

Perform all or any of the following steps necessary to bring the Exerciser to standby:

1. Press SYSTEM ON/OFF switch to apply power to the Exerciser.

2. Verify that only the SYSTEM ON/OFF indicator, WRITE RESET indicator and STOP indicator are lit. Ignore WRITE DATA indicators. If the STOP indicator is not lit, intermittently depress PROCESSOR RESET until it does light.

3. Press PARITY ERRORS-RESET switch. Verify that SOFT ERROR and HARD ERROR displays are reset to zero.

4. Verify that all cable connections are made to the transport. See Figure 2-1. Verify that a cartridge which is write enabled is installed in the transport.

5. Verify that the current sense loop or ammeter is in place.

6. Press TRANSPORT-ECR-10 460-9101 switch to apply power to the transport.

7. Verify that the TRANSPORT-ECR-10 460-9101 indicator is lit.

8. Observe address position selected on transport and press corresponding MOTION CONTROL select switch (SELECT 1 through SELECT 4) on Exerciser. Verify that select switch selected indicator lights.

9. Verify that STATUS INDICATOR-READY indicator is lit. If indicator is not lit close transport door.

10. Verify that STATUS INDICATOR-BOT indicator is lit. If indicator is not lit, press MOTION CONTROL-REWIND switch. STATUS INDICATION-IN REWIND indicator will light and READY indicator will extinguish while tape is in rewind motion.

Note

Transport motion cannot be interrupted while tape cartridge is rewinding (IN REWIND indicator lit).

When transport tape cartridge has rewound to beginning-of-tape, the IN REWIND indicator will extinguish and the BOT indicator will light.

3-5. WRITE DATA MODE

Write Data mode produces continuous or block data for recording on the transport tape.

1. Ensure that Exerciser is in the Standby mode (see paragraph 3-4).

2. Select the WRITE DATA to be recorded on tape. The WRITE DATA SWITCHES (PAT./0/1) provide individual track selection of data. All tracks can be set to same data (encluding parity in ALL 0) by pressing ALL 0, ALL PAT., or ALL 1 pushbutton switches. The WRITE DATA indicators will light to indicate the type of data selected for each track.

3. Press DATA CONTROL-WRITE switch.

4. Press MOTION CONTROL-RUN FORWARD switch. Verify that the STOP and WRITE RESET indicators extinguish and RUN FORWARD indicator lights.

Continuous data will be recorded on transport tape in this mode. Errors (parity errors) will be counted and displayed on the SOFT ERROR digital display while the transport is in write mode. While the transport is in motion, no other control (data or motion) can be changed until the transport motion is stopped.

5. Press STOP switch to stop transport motion. Verify that the STOP and WRITE RESET indicators light and RUN FORWARD indicator extinguishes.

Note

If tape is allowed to run to EOT, Exerciser will automatically rewind the tape to BOT.

6. Press DATA CONTROL-WRITE switch. Verify that indicator extinguishes.

7. Press REWIND.

3-6. WRITE DATA OPTIONS

The following options are available in the Write Data mode. Any one of the options can be selected in conjunction with the WRITE switch as described in paragraphs 3-7 through 3-10.

3-7. BLOCK MODE

Produces data in 256 byte or 4K byte blocks. Each block is ended with a CRC (CYCLIC REDUNDANCY CHECK) and LRC word.

1. Ensure that the Exerciser is in the Standby mode (see paragraph 3-4).

2. Set the DATA CONTROL switches as follows:

CONT. READ	- OFF
REPEAT ON ERROR	- OFF
4K BLOCK	- OFF
SHIFT ONES	- OFF
BLOCK MODE	- ON
WRITE	- ON

3. Press MOTION CONTROL-RUN FORWARD switch. Verify that the STOP indicator extinguishes and the RUN FORWARD and WRITE RESET indicators flicker.

Data will be recorded on transport tape in 256 byte blocks. Errors (parity errors) will be counted and displayed on the SOFT ERROR digital display. While the transport is in motion, no other control (data or motion) can be changed until the transport is stopped.

4. Press STOP switch to stop transport motion. Verify that the STOP indicator lights and the RUN FORWARD indicator extinguishes.

5. Press BLOCK MODE and WRITE switches. Verify that respective indicator lights extinguish.

6. Press REWIND.

3-8. 4K BLOCK

Produces data in 4096 byte blocks. This mode must be selected in conjunction with the BLOCK MODE switch.

1. Ensure that Exerciser is in the Standby mode (see paragraph 3-4).

2. Set the DATA CONTROL switches as follows:

CONT. READ	- OFF
REPEAT ON ERROR	- OFF
4K BLOCK	- ON
SHIFT ONES	- OFF
BLOCK MODE	- ON
WRITE	- ON

3. Press MOTION CONTROL-RUN FORWARD switch. Verify that the STOP indicator extinguishes and the RUN FORWARD and WRITE RESET indicators flicker.

Data will be recorded on transport tape in 4096 byte blocks. Errors (parity errors) will be counted and displayed on the SOFT ERROR digital display. While the transport is in motion, no other control (data or motion) can be changed until the transport is stopped.

4. Press STOP switch to stop transport motion. Verify that the STOP and RUN FORWARD indicator lights extinguish.

5. Press 4K BLOCK, BLOCK MODE and WRITE switches. Verify that respective indicator lights extinguish.

6. Press REWIND.

3-9. SHIFT ONES

This function is recommended for skew measurements.

1. Ensure that Exerciser is in Standby mode (see paragraph 3-4).

2. Set the DATA CONTROL switches as follows:

CONT. READ	- OFF
REPEAT ON ERROR	- OFF
4K BLOCK	- OFF
SHIFT ONES	- ON
BLOCK MODE	- OFF
WRITE	- ON

3. Press WRITE DATA-ALL PAT, pushbutton switch. Verify that the nine WRITE DATA switches are lit with a PAT.

4. Press MOTION CONTROL-RUN FORWARD switch. Verify that the STOP and WRITE RESET indicators extinguish and the RUN FORWARD indicator lights.

The Exerciser produces a byte of all ones, then a one in each subsequent track between the all ones byte. A sync pattern of 16 bits of one-zero, followed by 16 ones, is produced on the parity track.

000001000
111111111
000000100
111111111
000000010
111111111
000000001

5. Press STOP switch to stop transport motion. Verify STOP and WRITE RESET indicators light and RUN FORWARD indicator extinguishes.

6. Press SHIFT ONES and WRITE indicators. Verify respective indicators extinguish.

7. Press REWIND.

3-10. REPEAT ON ERROR

Repeat on error is a read function and can be selected for Read or Write mode of operation. In WRITE mode, REPEAT ON ERROR must be selected in conjunction with BLOCK mode.

1. Ensure that Exerciser is in the Standby mode (see paragraph 3-4).

2. Set the DATA CONTROL switches as follows:

CONT. READ	- OFF
REPEAT ON ERROR	- ON
4K BLOCK	- OFF or ON (optional)
SHIFT ONES	- OFF
BLOCK MODE	- ON
WRITE	- ON

3. Press RUN FORWARD switch. Verify that RUN FORWARD indicator lights and STOP indicator extinguishes.

The Exerciser always reads data from tape in the WRITE/RUN FORWARD mode. Repeat on error commands the transport to repeat one block of data (read function) each time an error is detected by the read circuits. The Exerciser automatically disables the write circuits and repeats the block in error. If the error is recovered within three passes, the transport then continues running in the WRITE mode. If the error is not recovered in three passes of the data block, the error is displayed as a HARD ERROR. The Exerciser then continues to write blocks of data until another error is detected (see paragraph 4-5).

Note

The DATA CONTROL-WRITE indicator will extinguish each time the repeat on error operation is being performed.

4. Press STOP switch to stop transport motion. Verify that STOP indicator lights and RUN FORWARD indicator extinguishes.

5. Press REPEAT ON ERROR, 4K BLOCK (if selected), BLOCK MODE and WRITE switches. Verify that respective indicator lights extinguish.

6. Press REWIND.

3-11. CONT. READ

This function can be used to check transport motor noise or gap noise.

1. Ensure that Exerciser is in the Standby mode (see paragraph 3-4).

2. Set the DATA CONTROL switches as follows:

CONT. READ	- ON
REPEAT ON ERRORS	- OFF
4K BLOCK	- ON
SHIFT ONES	- OFF
BLOCK MODE	- ON
WRITE	- ON

3. Press MOTION CONTROL-RUN FORWARD switch. Verify that the STOP indicator extinguishes and the RUN FORWARD and WRITE RESET indicators flicker.

Continuous Read is a read function and can be selected for Read or Write mode of operation. The Exerciser's read circuits are not normally enabled until the tape transport has obtained near normal running speed (approximately 14 milliseconds). Continuous Read mode enables the Exerciser read circuits simultaneously wih the motion command. This allows the detection of errors prior to the transport obtaining normal running speed.

4. Press STOP switch to stop transport motion. Verify that STOP indicator lights and RUN FORWARD indicator extinguishes.

5. Press the CONT. READ, 4K BLOCK, BLOCK MODE and WRITE switches. Verify that respective indicators extinguish.

6. Press REWIND.

3-12. READ DATA MODE

Read Data mode enables data to be read as recorded on tape.

1. Ensure that Exerciser is in the Standby mode (see paragraph 3-4).

2. Press MOTION CONTROL-RUN FORWARD switch. Verify that the STOP indicator extinguishes and the RUN FORWARD indicator lights.

The Exerciser will read data as recorded on tape. The PARITY ERRORS display will count and display detected errors. The VRC ERROR and LRC ERROR indicators will display the type of error detected.

3. Press STOP switch to stop transport. Verify that STOP indicator lights and RUN FORWARD indicator extinguishes.

4. Press REWIND.

3-13. READ DATA OPTIONS

Three options are available in the Read Data mode. DATA CONTROL-CONT. READ, BLOCK MODE, and BLOCK MODE with REPEAT ON ERROR can be selected in Read Data Mode. Refer to paragraphs 3-7, 3-10 and 3-11 for operation of these functions.

Data will be played back in the same format as recorded.

After the write data format has been selected and recorded on tape, the data can be read as follows:

1. Ensure that Exerciser is in the Standby mode (see paragraph 3-9).

2. Press MOTION CONTROL-RUN FORWARD switch. Verify that STOP indicator extinguishes and RUN FORWARD indicator lights.

The Exerciser will read data as recorded on tape. The PARITY ERRORS will count and display detected errors. The VRC ERROR and LRC ERROR indicators will display the type of error detected.

3. Press STOP switch to stop motion of transport. Verify that STOP indicator lights and RUN FORWARD indicator extinguishes.

4. Press REWIND.

3-14. MOTION CONTROL

The MOTION CONTROL switches enable the transport in the commanded direction.

Note

SELECT 1 through SELECT 4 switches and indicators are grouped under MOTION CONTROL but are address select switches.

3-15. REWIND

Enables the transport in REWIND operation. When REWIND is selected, no errors are detected. The IN-REWIND status indicator will light. The transport motion cannot be stopped until Beginning-of-Tape (BOT) is reached. At this time BOT indicator will light, IN-REWIND indicator will extinguish, and REWIND switch indicator will extinguish.

3-16. FAST

Enables the transport in FAST tape motion when combined with RUN FORWARD or RUN REVERSE switches. The Exerciser will not write data or read errors in the FAST mode. The transport can be stopped during FAST mode by pressing the STOP switch.

3-17. RUN REVERSE

Enables the transport in reverse tape motion. The Exerciser will not write data or read errors in Reverse mode. The transport can be stopped during Reverse mode by pressing the STOP switch.

3-18. RUN FORWARD

Enables the transport in forward tape motion. RUN FORWARD enables only the read circuits. The transport can be stopped in RUN FORWARD mode by pressing the STOP switch.

SECTION IV
FUNCTIONAL DESCRIPTION

4-1. INTRODUCTION

This section provides an overall functional description of the Exerciser. The interrelationship of the system's major components is discussed first, followed by a more detailed functional description of each major circuit.

4-2. SYSTEM DESCRIPTION
(See Figure FO-2)

The Exerciser provides write data and control functions to the ECR-10 Transport for bench test operations. The Exerciser also receives the read data from the transport and checks the data for VRC (parity) and LRC errors. The Processor Circuit Card controls the manipulation of data within the Exerciser, the generation of data, the recording and testing of data from the transport and the motion control of the transport.

The Processor Circuit Card circuits contain programs in memory that respond to selected switches on the front panel of the Exerciser. The processor also controls the timing for generation of WRITE DATA. All commands from the motion control switches on the front panel are issued to the processor. The processor performs timed routines to check status of the transport before issuing the motion control commands. The processor also receives inputs from the data control switches and then produces the appropriate control signals to generate the selected write data. All commands for the writing and reading of data and motion selection for the transport communicate through the processor.

The Clock and Format Generator Circuit Card generates the clock rate pulses for the system. It also establishes the timing for the generation of WRITE DATA and CRC WORD. The generator reports the timing sequence of the write data to the processor.

The Write Data Circuit Card receives the write data and adds the CRC WORD and shifted ones when requested, and issues eight bits of parallel data and parity bit to the transport.

The Data Control Select Circuit Card responds to the data control switches on the front panel. The selection of data is reported to the processor. When the transport is in motion, the processor provides commands to the data control select circuits that prevent selection of new data until transport motion has stopped.

The Transport Status circuits receive status information from the transport to illuminate indicators on the front panel. The Transport status information is also reported to the processor as interrupt status.

The Read Data circuits receive the reproduced data (READ DATA) from the transport. The data is processed through an LRC check and a parity check (VRC). The errors are accumulated and displayed on two-digit LED displays. All errors are reported to the processor as an interrupt status.

4-3. PROCESSOR (Circuit Card 1A2A3)
(See Figure FO-3)

The Processor Circuit Card contains the controlling circuits for the Exerciser. The processor uses a Signetics 2650 microprocessor as the central controller. (See Figure 4-1, Processor Block Diagram.) A basic understanding of microprocessors is required for a complete understanding of the Processor Circuit Card.

The 2650 microprocessor is a general purpose, single chip, parallel 8-bit binary processor. The processor performs data manipulations through execution of a stored sequence of machine instructions. The processor closely resembles conventional binary computers.

The DATA BUSS forms an 8-bit bi-directional data path in and out of the microprocessor. The direction of the data flow on the DATA BUSS is indicated by the state of the R/W line. For write operations, the output buffers in the microprocessor output the data to the DATA BUSS. For read operations, the buffers are disabled and the data condition of the DATA BUSS is sensed by the microprocessor. The signals on the DATA BUSS are true signals, i.e., a one is a high level and a zero is a low level. See Figure FO-3 tor microprocessor signals.

The ADDRESS BUSS is a 12-bit path out of the microprocessor and is used primarily to supply memory address during memory operation. The addresses remain valid as long as OPREQ (Operation Request) is true (high).

The OPREQ output from the microprocessor is the coordinating signal for the Function Decoder operation.

The $\overline{\text{INTREQ}}$ (Interrupt Request) input to the microprocessor is a means to change the flow of program execution. When an $\overline{\text{INTREQ}}$ is received, the current instruction is completed before the interrupt is serviced. When the microprocessor is ready to accept the interrupt,it sets the INTACK (Interrupt Acknowledge) output to high. The INTACK output is used by the microprocessor to respond to the interrupt. The INTACK is used to enable tri-state buffers on the DATA BUSS, providing a boot strap address to the microprocessor.

The MEMORY/$\overline{\text{IO}}$ output from the microprocessor is one of the operation control signals that defines external operations. M/$\overline{\text{IO}}$ which indicates whether an operation is memory or I/O is used to gate the Function Decoder.

The $\overline{\text{R}}$/W (Read/Write) output from the microprocessor is the operation control signal that defines external operations. $\overline{\text{R}}$/W is an input to the function decoder for selection of input or output ports.

The WRITE PULSE (WRP) output from the microprocessor is a timing signal that provides a positive-going pulse in the middle of each requested write operation, and a continuous high level during read operations. WRP is used to enable the Function Decoder for the selected operation.

The SENSE line (Status Input) is an independent input from the DATA BUSS that receives single bit data from the Status Input port.

The FLAG line (Data Out) provides a single bit output to the selected output port.

1K ROM memory contains all the required routines for the microprocessor. The ROM is addressed by the microprocessor and outputs its data on the DATA BUSS. The Function Decoder enables one of four Output Latches for receipt of DATA BUSS information. One of the Output Latches transfers the data to the I/O ADDRESS BUSS. Data on the I/O ADDRESS BUSS is used to address one of the I/O ports. The microprocessor then outputs a data bit on the FLAG line. The FLAG line data bit is outputed on the addressed I/O port. When input status is requested, the I/O ADDRESS BUSS selects one of 16 status input lines to be inputed on the SENSE line.

Memory Data on the DATA BUSS is also applied to output latches that provide control data directly to the Exerciser circuits or the transport.

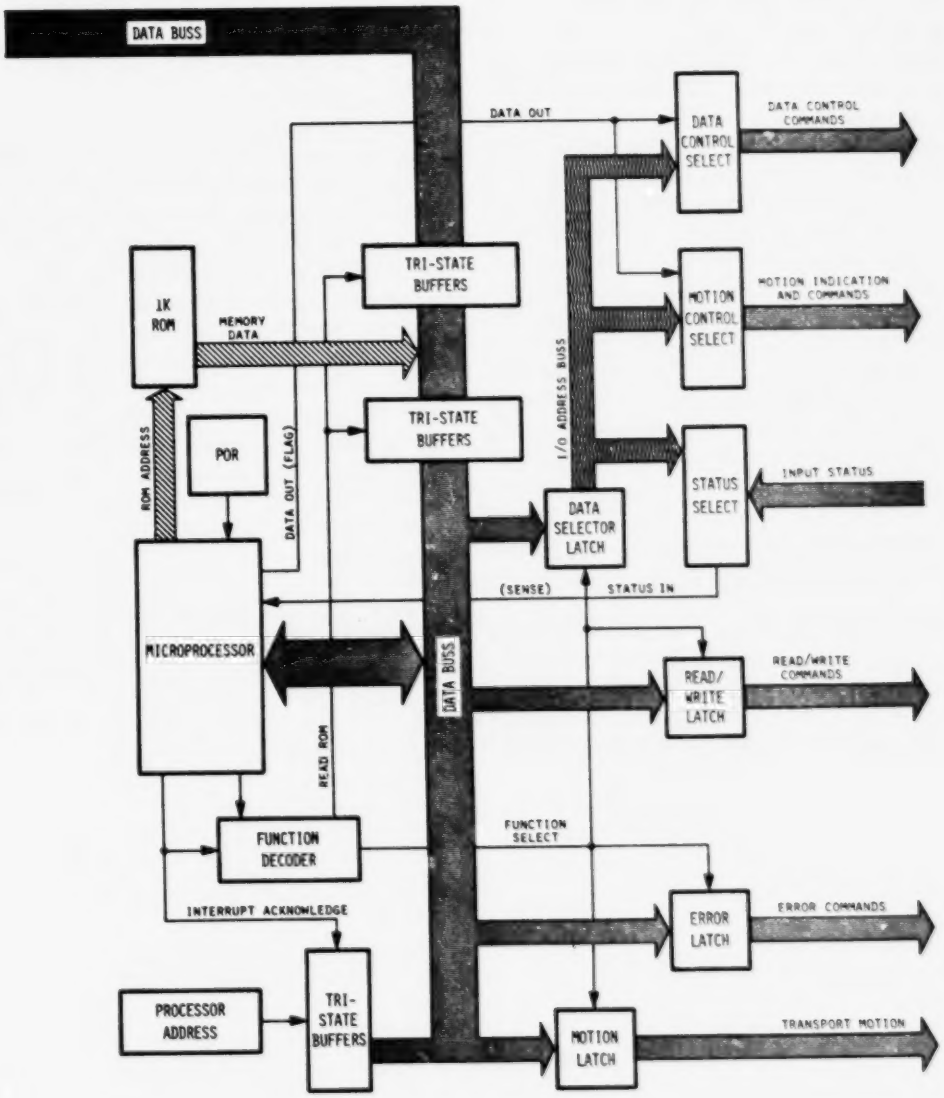


Figure 4-1. Processor Block Diagram

4-4. WRITE DATA CONTROL (Circuit Card 1A2A5) (See Figure FO-4)

The generation of WRITE DATA starts with the write data control circuits. (See Figure 4-2, Write Data Control Block Diagram.)

WRITE CLOCK pulses (CLOCK WP) from the clock generator circuit card are routed through a non-retriggerable delay circuit to the write data counter. The counter consists of a 2^8 counter (256 bits) and a divide-by-sixteen counter. The START DATA issued from the processor resets the END BLOCK latch, which enables the write card counter. When the counter has reached a count of 256 (short block), a pulse is issued to the End Block Latch. The latch then produces the END BLOCK signal to the format generator circuit card, indicating an end-of-block has occurred. When 4K BLOCK has been selected on the front panel data control switches, the 4K BLOCK IND signal from the data control circuit card will inhibit the 256 pulse, allowing the divide-by-sixteen counter to continue counting. After counting 4096, the counter will then issue a pulse to the End Block Latch. The END BLOCK signal will then be issued to the format generator. The END BLOCK signal is issued concurrently to the processor as an indication of block mode status.

The CLEAR DATA GEN signal is issued from the processor. This signal is issued before a START DATA pulse to set the End Block Latch. The set condition of the End Block Latch provides a reset to the write data pattern counter clearing the counter to zero. When the counter is started it will then count a full block.

When in block mode, the end of each block is initiated when END BLOCK is set. An IRG (Inter Record Gap) is then generated before the next block or the end of operation by a STOP command. When BLOCK MODE is not selected, the mode is continuous and the END BLOCK is not allowed until the STOP command has been set.

The WRITE DATA consists of 8 data bits and a parity bit. The write data switches on the front panel can be individually enabled to select the logic level for each bit. Switches are also provided on the front panel that will set the Write Data Latch to ALL 1, ALL 0, or ALL PAT. When ALL PAT. switch is enabled, the data block pattern will be the pattern produced by the write data pattern counter. The output of the Write Data Latches is applied to lamp drivers to illuminate the selected switch indicator. Eight outputs from the write data pattern counter are combined with the appropriate bit from the Write Data Latches into the Write Data Decoders. The Write Data Decoders produce an 8-bit data block (WC0-WC7) and a parity bit (WPT). PARITY CHECK signal is produced from the write data circuit card.

The first five bits of WRITE DATA (WCNT0-WCNT4) are routed to the write data circuit card to be used in programming the SHIFTED ONES function.

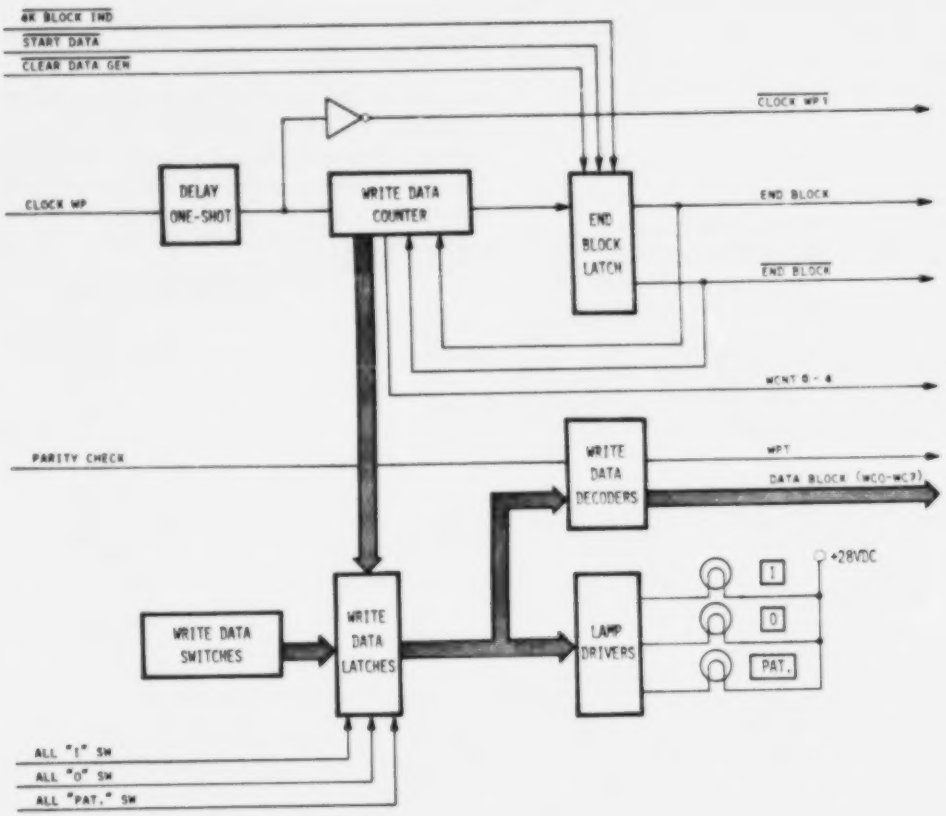


Figure 4-2. Write Data Control Block Diagram

4-5. WRITE DATA (Circuit Card 1A2A6) (See Figure FO-5)

The Write Data circuits receive the data block from the write data control circuits, adds the CRC word, and generates parity before issuing the write data to the transport. (See Figure 4-3, Write Data Block Diagram.)

The DATA BLOCK (WCO-WC7) from write data control circuit card is applied to the data word selector. The CRC WORD pulse from the format generator circuit enables the data word selector to select the input from the CRC word switches. The switches are pre-set to the determined CRC word. The CRC word is written during one clock period.

The SHIFTED ONES IND input is issued from the data control circuits and selects an input to the data word selector from the shifted ones selector. WCNT-1 through WCNT-4 is a binary input to the shifted ones selector. The binary input will select one output from the selector. Each time the binary input changes, the selected output changes. Each selected output produces a logic one to the data word selector. This results in a shifted ones pattern in the WRITE DATA, as shown below.

0 0 0 0 0 1 0 0 0
1 1 1 1 1 1 1 1 1
0 0 0 0 0 0 1 0 0
1 1 1 1 1 1 1 1 1
0 0 0 0 0 0 0 1 0
1 1 1 1 1 1 1 1 1
0 0 0 0 0 0 0 0 1

The SHIFTED ONES mode is normally used to check the transport for measurement of combined skew and jitter.

The WRITE DATA (WD0-WD7) from the data word selector is routed through output buffers to the transport. The output buffers invert the data for negative logic input to the transport.

Each data track is applied to a parity decoder to check for even parity of each data byte. The output of the parity decoder is issued to the write data control circuits.

Errors are inserted by enabling the front panel switch, INSERT ERRORS. This is a momentary switch that sets an error latch, which changes the parity decoder to read odd parity. Since parity should always be even, odd parity from the parity decoder is detected as an error. The next clock pulse resets the error latch.

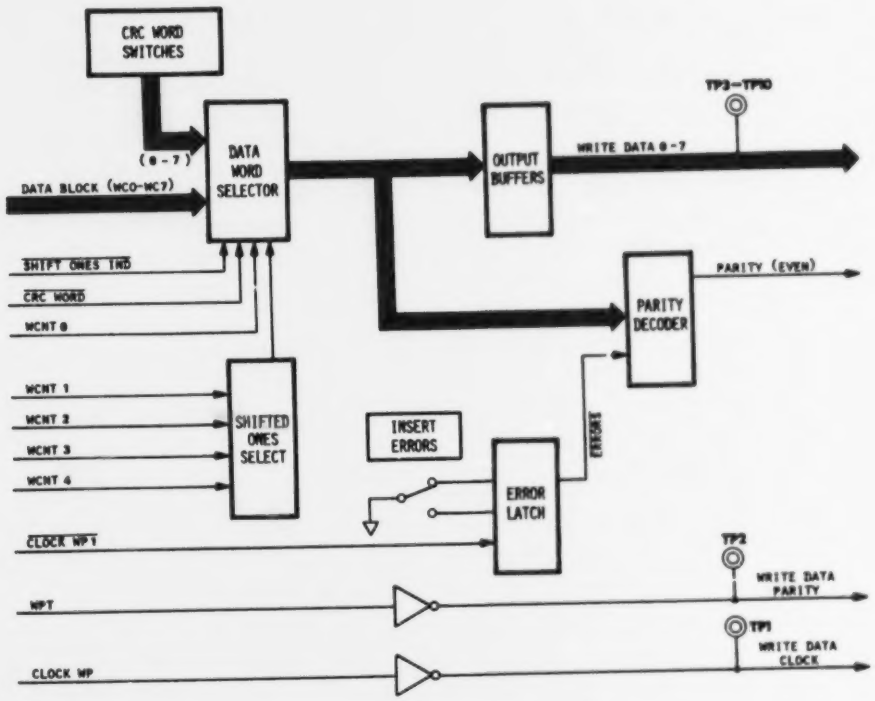


Figure 4-3. Write Data Block Diagram

4-6. CLOCK AND FORMAT GENERATOR
(Circuit Card 1A2A1) (See Figure FO-6)

The Clock and Format Generator circuits provide the proper timing for the read and write of data. (See Figure 4-4, Clock and Format Generator.)

A 10 MHz crystal oscillator provides the basic clock input. The 10 MHz clock is applied to a divide-by-eight counter to produce 1.25 MHz clock for the microprocessor. The 10 MHz clock also steps the Start/Stop Delay Counter. The Start/Stop Delay Switches are preset to the desired start/stop

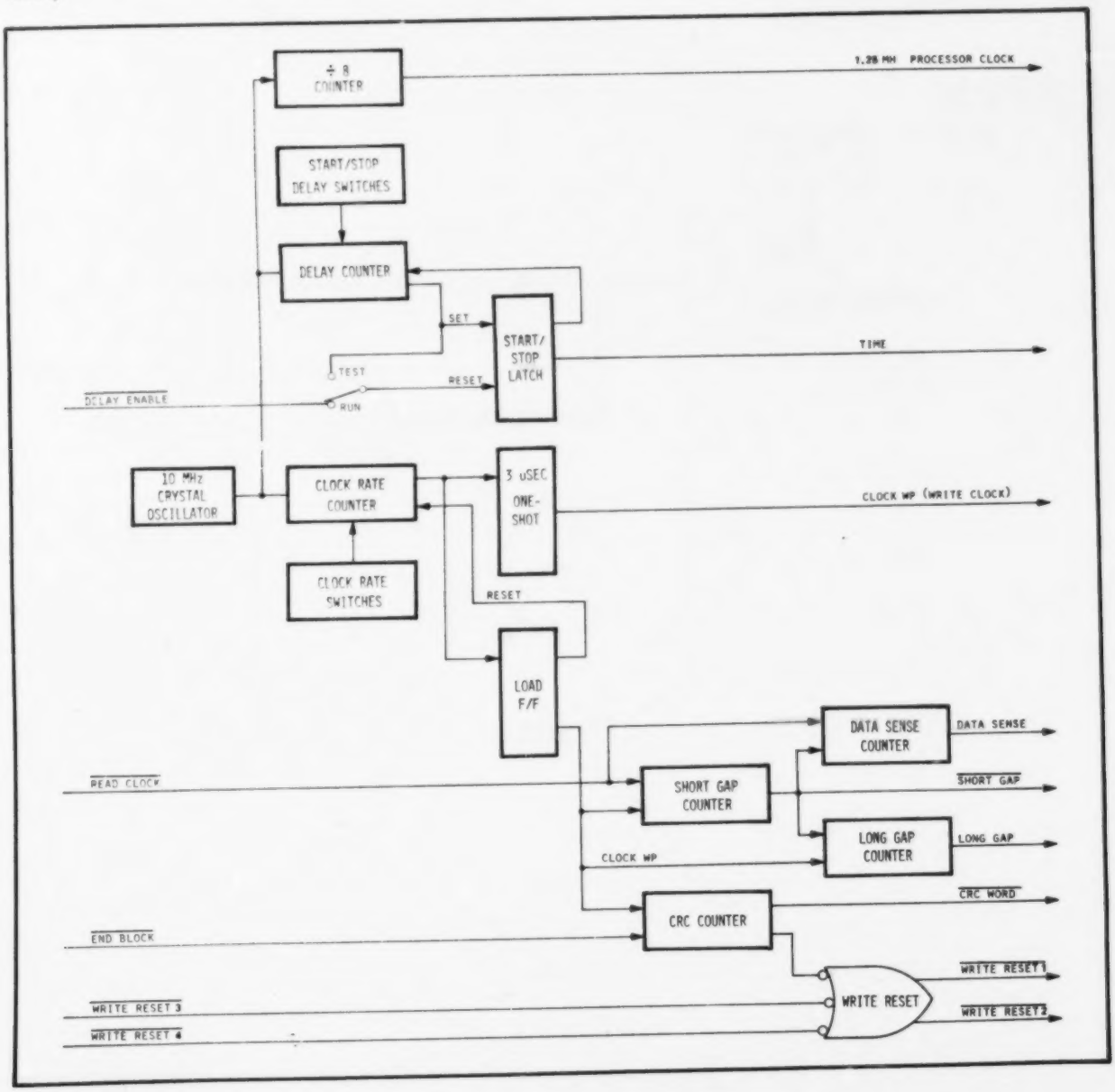


Figure 4-4. Clock and Format Generator Block Diagram

time. This is the time allotted for the transport to accelerate and de-accelerate between the writing of data blocks. (See Figure 4-5, Tape Motion and Data Concept.) The output of the counter is applied to a start/stop latch. A DELAY ENABLED pulse from the processor resets the latch, which enables the delay counter to start counting from the selected time set into the start/stop delay switches. When the counter reaches a full count, the output from the counter sets the start/stop latch. This produces the TIME pulse to the processor. The TIME pulse informs the processor that data can now be written on tape.

The 10 MHz clock provides an input to the Clock Rate Counter. The Clock Rate Switches provide a preset input to the counter to determine a WP CLOCK (Write Clock) time for the Exerciser. Each time the counter reaches a full count, a 3 μsec One-Shot is fired to produce the WP Clock pulse. The Load Flip-Flop is also enabled, which produces a reset pulse to the Clock Rate Counter and a clock input to the Gap and CRC counters. The output of the Load Flip-Flop is at WP Clock rate.

Three timing functions are issued to the processor from the Clock and Format Generator circuit card. They are used to sense data and gaps in block mode.

1. $\overline{\text{DATA SENSE}}$ pulse informs the processor that data is being received from the transport. $\overline{\text{READ CLOCK}}$ is received from the transport only when data is received. The $\overline{\text{READ CLOCK}}$ pulses are counted by the Data Sense Counter. When eight $\overline{\text{READ CLOCK}}$ pulses have been counted before a SHORT GAP pulse is detected, a DATA SENSE pulse is issued to the processor.

2. $\overline{\text{SHORT GAP}}$ pulse informs the processor that End-Of-Block has occurred in the data from the transport. The Short Gap Counter is a 2-bit counter. The WP CLOCK pulse steps the counter

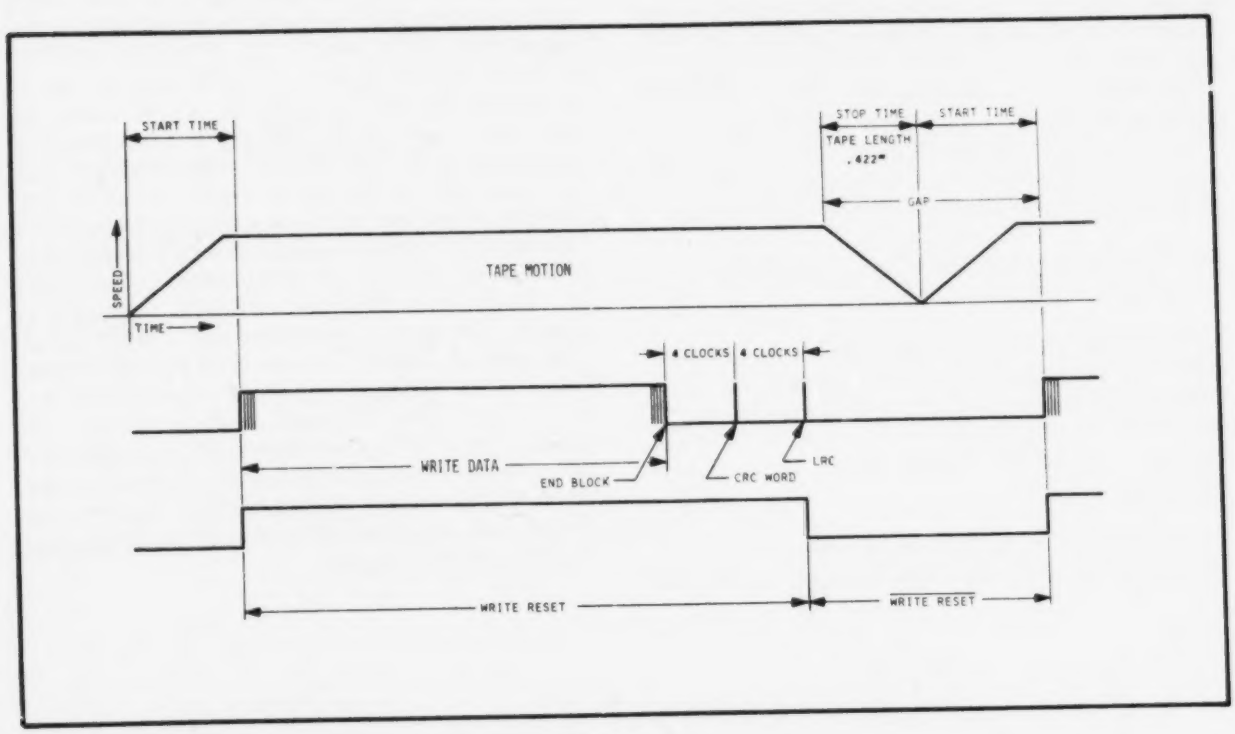


Figure 4-5. Tape Motion and Data Concept

on each clock pulse. When READ CLOCK is received from transport data, the counter is reset. (WP CLOCK and READ CLOCK occur at the same rate, one clock period apart.) When READ CLOCK is not received it is assumed that the Data Block has ended. The Short Gap Counter will then count two WP CLOCK pulses and issue a SHORT GAP pulse to the processor.

3. LONG GAP pulse informs the processor of LRC word time. When the processor receives a LONG GAP pulse, it then issues the WRITE RESET and DELAY ENABLED pulses. When a SHORT GAP is detected the Long Gap Counter is enabled, counting WP CLOCK pulses. When the counter has counted eight WP CLOCK pulses, a LONG GAP pulse is issued to the processor. A READ CLOCK from the transport will inhibit the Long Gap Counter from counting.

END BLOCK signal from the Write Data Control circuit card starts the CRC Counter. When the counter has loaded three WP CLOCK pulses, a CRC WORD pulse is issued to the Write Data circuit card. This enables the CRC WORD to be selected on the fourth data byte after END BLOCK has been issued. The CRC Counter continues to count to eight. At count eight a WRITE RESET pulse is issued to the processor and the transport. The eight count also resets the CRC Counter. The data of the CRC word is selected (factory set) with switches (U15) on the Read/Write circuit card.

4-7. READ DATA (Circuit Card 1A2A6) (See Figure FO-5)

The Read Data circuits receive the record data from the transport. The data is checked for VRC (Vertical Redundancy Check) errors (parity error) and LRC (Longitudinal Redundancy Check) errors. (See Figure 4-6, Read Data Block Diagram.)

Nine tracks of data are received from the transport (bits 0-7 and parity bit) and applied to Input Buffers. (Front panel test points are the input signals from the transport.) The buffers convert the input data from negative to positive logic. The data from the buffers is loaded into LRC Registers. The READ CLOCK from the transport loads the data into the LRC Registers. The LRC error check is not made until the entire block of data has exercised the LRC Registers. During a block of data, an even number of ones will have appeared on each track. Therefore, if no errors have occurred in the data track, the LRC Registers will have toggled to a reset state at the end of the data block. If an error did occur in a data track, the register for the error track will toggle an odd number of times, leaving an error indication when LRC check is made at the end of block. LRC CHECK signal from the processor enables the LRC Error Gate and then resets all of the LRC Registers for the next block of data.

The eight bits of data are checked for parity error against the parity track from the transport. ENABLE ERROR signal is issued from the processor enabling the error parity gate. An error output from the LRC or Parity Error gate will set the respective error lamp, LRC ERROR or VRC ERROR, indicating that an error has occurred. Each time an error is detected on the output of either error gate, an ERROR signal is issued to the processor. A CLEAR ERROR pulse is issued from the processor at the end of each data block, i.e. only one error sent to the processor will cause the processor to repeat a data block if REPEAT ON ERROR is selected. All parity errors (VRC error) are loaded into the SOFT ERROR counter and display. The display is enabled after each block of data with an ENABLE pulse from the processor. The HARD ERROR counter is loaded from the processor. The Repeat-On-Error mode will produce an error count when a block of data has been repeated three times without recovery of the error. Therefore, the HARD ERROR counter and display will count errors only in Block Mode and Repeat-On-Error mode.

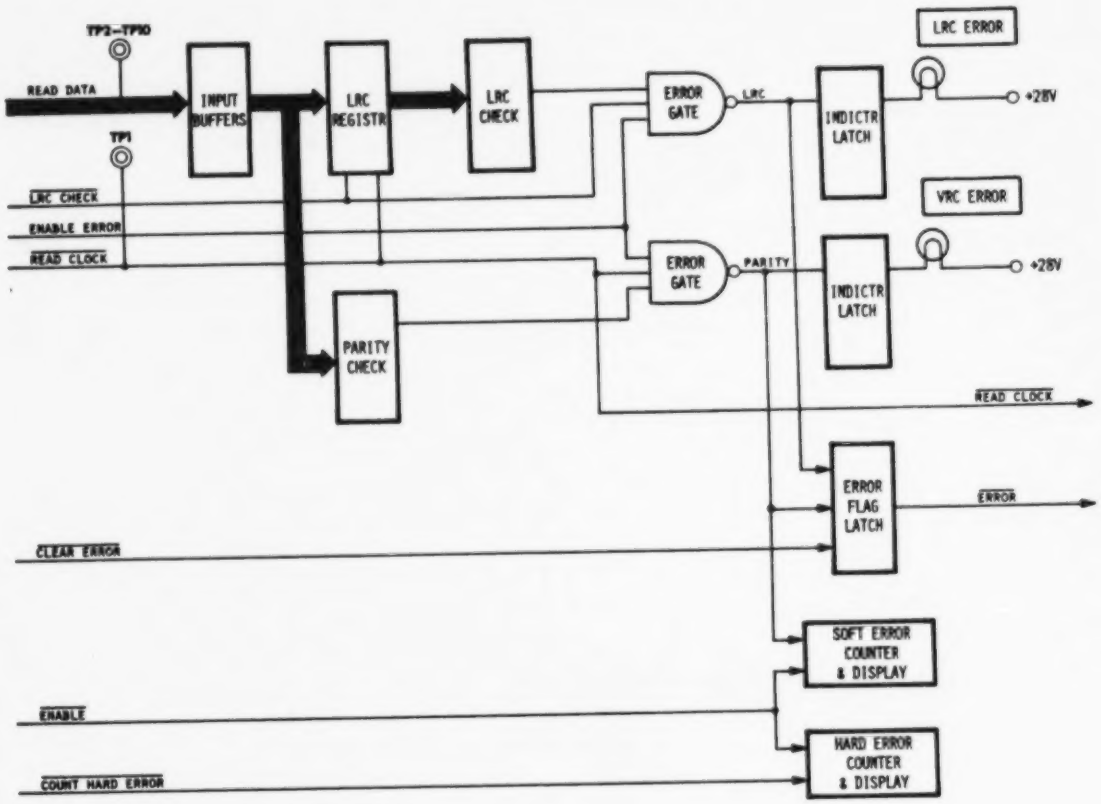


Figure 4-6. Read Data Block Diagram

4-8. TRANSPORT STATUS (Circuit Card 1A2A1) (See Figure FO-6)

The status circuit receives status information from the transport to light status indicators on the front panel of the Exerciser. (See Figure 4-7, Transport Status Block Diagram.)

Transport status lines are received through buffers that convert the transport negative logic to the Exerciser positive logic levels. The outputs of the buffers are applied to Lamp Drivers that provide a return signal for the enabled status indicator. The status indicators operate on +28 Vdc.

The status lines are also routed to the status selector on the processor circuit card. The Exerciser indicates transport status for the following functions: WRITE, SELECTED, READY, IN REWIND, BOT (Beginning-Of-Tape), and EOT (End-Of-Tape).

4-9. DATA CONTROL (Circuit Card 1A2A2) (See Figure FO-7)

The Data Control circuits select the type of data to be written on tape. (See Figure 4-8, Data Control Block Diagram.)

The Data Select switches are push-ON/push-OFF type switches. When a Data Switch is selected the switch latch is set. The outputs of the latches are applied through open collector buffers to lamp drivers. The lamp drivers provide a return for the 28 Vdc indicator lamps.

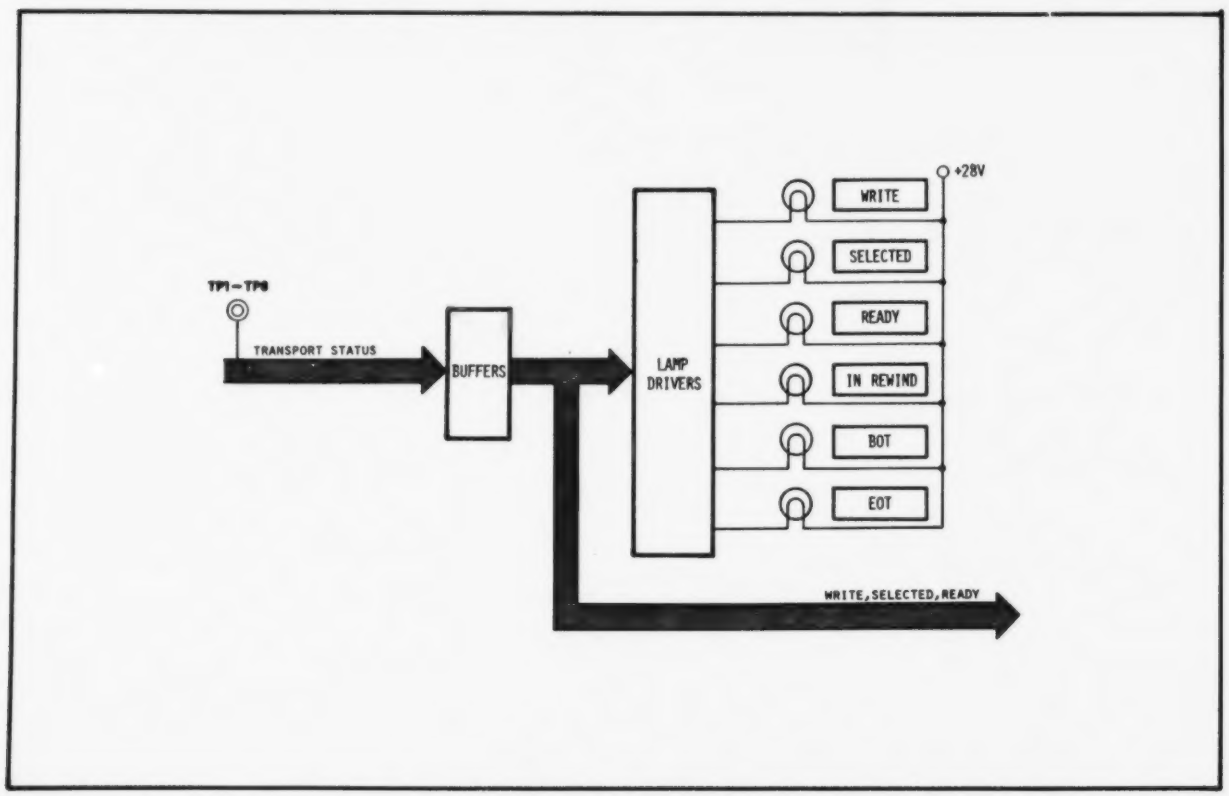


Figure 4-7. Transport Status Block Diagram

The outputs of the Data Select latches are also applied to external circuits. 4K BLOCK IND is applied to the Write Data Control circuits to inhibit the 256-bit counter. This will allow a second counter to continue counting to 4096 bits. The SHIFT ONES IND is applied to the Write Data circuits. This signal selects an output from the Data Word Selector (See Figure 4-3) that will allow ones to shift through the eight tracks of data. The remaining outputs from the Data Select Latches provide status inputs to the processor which include: CONT READ IND, REPEAT ON ERROR IND, BLOCK MODE IND, and WRITE IND.

PULSE INPUT 2 from the processor is used to clock the selected switch data into the Data Select Latches. CLEAR F/F signal from the processor clears all latches except the Write Latch. WRITE R and WRITE S from the processor are used to set or reset the WRITE latch on command.

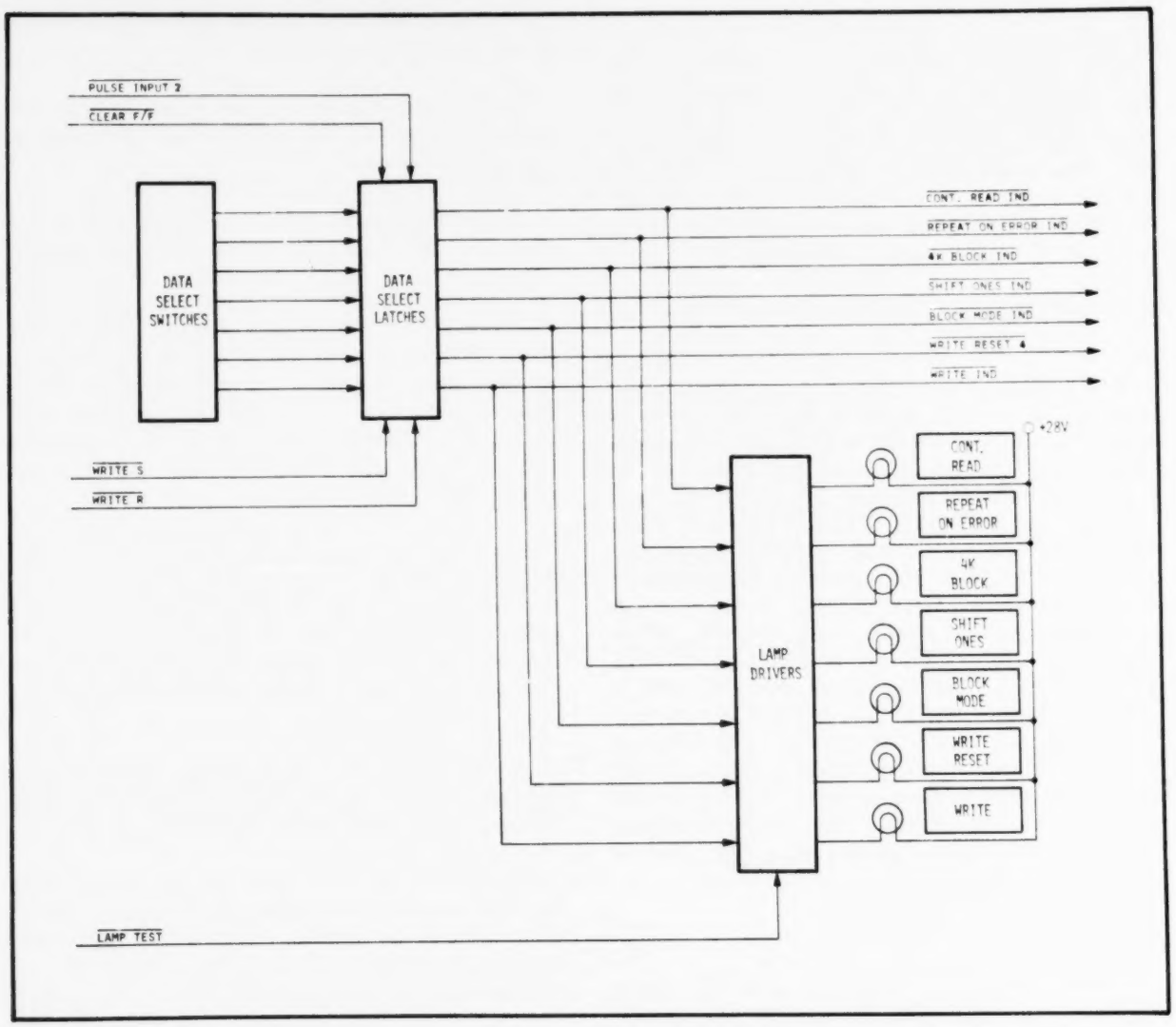


Figure 4-8. Data Control Block Diagram

4-10. MOTION CONTROL (Circuit Card 1A2A4) (See Figure FO-8)

The Motion Control circuits select the required motion for the transport. (See Figure 4-9, Motion Control Block Diagram.)

The Motion Control switches are push-ON/push-OFF type switches. When any of the RUN, FAST, or REWIND motions have been selected, the latches are locked out from accepting another motion until the STOP switch is enabled. All the motion select latches are set and reset by commands from the processor.

The Latched outputs from the Motion Select Latches are applied to the processor to indicate the required motion. The latch outputs are also applied through open collector gates to Lamp Drivers. The Lamp Drivers provide return path for the 28 Vdc indicator lamps. SELECT 1 IND through SELECT 4 IND, lines are routed directly to the transport to enable select interlocks.

4-11. EXTERNAL START (Block Mode only) (See Figure FO-5)

The External Start connector (J4) provides an input for an external signal to start each block of data when BLOCK MODE is selected. A dc signal greater than 2.5 Vdc (or open input) will turn on a dual operational amplifier, producing two low level remote start signals ($\overline{\text{REMOTE START 1}}$ and $\overline{\text{REMOTE START 2}}$). The remote start signals are applied to the Status Select latch on the processor circuit card. The microprocessor scans each of the status inputs at programmed intervals. When the microprocessor detects a $\overline{\text{REMOTE START 1}}$ or $\overline{\text{REMOTE START 2}}$ signal (SENSE LINE is high), the Write Data circuits are enabled to start generating the next block of data. The External Start signal should be a continuous level (2.5 Vdc to 5.0 Vdc) to generate a continuous string of data blocks. When the External Start signal is pulsed, the data blocks will be generated at the External signal pulse rate.

4-12. SYNC

The microprocessor produces a $\overline{\text{SYNC}}$ pulse (U44-16) concurrent with the start of each block of data when BLOCK MODE is selected (see Figure FO-3). The $\overline{\text{SYNC}}$ pulse is applied to an open collector buffer, producing a negative-going TTL pulse at the SYNC connector at the start of each block of data (see Figure FO-5).

4-13. POWER DISTRIBUTION (See Figure FO-9)

The Exerciser power consists of +28 volts regulated, +5 volts #1 regulated, and +5 volts #2 regulated. (See Power Supply Schematic, Figure FO-10.)

Primary power (115 vac) is applied to the Power Supply Assembly (1A1) through connector J1. A 5 amp SLO-BLO fuse provides main power short circuit protection.

An RFI line filter is inserted in series with the primary power to filter out RFI (Radio Frequency Interference) noise.

A solid state relay (K1) provides switching ON and OFF of primary power to the power supply regulators. The solid state relay is energized through the SYSTEM-ON/OFF switch, located on the Power Switch Assembly (Figure 4-10). When the SYSTEM-ON/OFF switch is pressed, 115 vac primary power is applied to the control input of the solid state relay. The control input (115 vac) causes the input relay contact to close. The closed contact routes the primary power to the three power supply regulators.

The +5 volt regulators (+5V #1 and +5V #2) each contain a 4 amp fuse (F1 and F2) for overvoltage protection. If the voltage from the regulator exceeds 5.6 Vdc, an SCR in the regulator is fired, causing the output voltage to short out. The shorted output voltage will cause the fuse to blow.

The output of the three voltage regulators is applied to the Connector Panel Assembly through connector P4. (See Figure FO-11.)

+5 Vdc #1 and +5 Vdc #2 are routed from the Output Connector Assembly through connectors J9/P9 to the mother board circuit board assembly. (See Figure FO-12.) The +5 Vdc #1 line provides power for circuit cards No. 1, No. 5, and No. 6 through the mother board. The +5 Vdc #2 line provides power for circuit cards No. 2, No. 3, and No. 4 through the mother board. (See mother board decoupling circuit, Figure 4-11.)

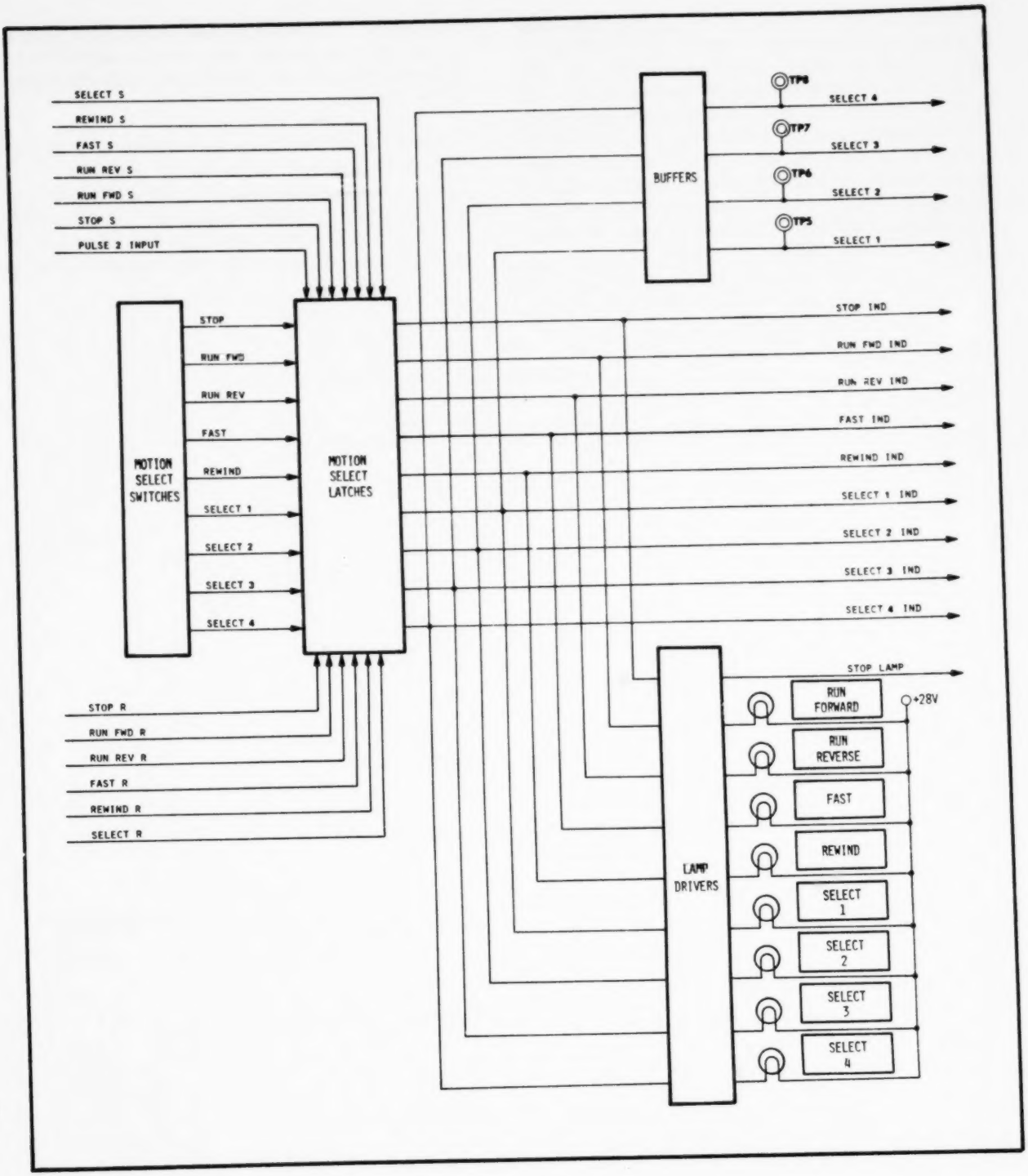


Figure 4-9. Motion Control Block Diagram

+28 Vdc from connector P4 on the connector panel is applied through fuses F1 and F2. Fuse F1 is a 5 amp SLO-BLO fuse and provides for +28 Vdc short circuit protection in the transport. +28 Vdc from fuse F1 is routed through connector J13/P13 on the Power Switch Assembly to the N.C. contacts on the SYSTEM-ON/OFF switch. Power from the SYSTEM-ON/OFF switch is routed through the N.C. contacts on the transport power switch to a CURRENT LOOP jack. The +28 Vdc is routed from the CURRENT LOOP jacks through connector P13/J13 on the Connector Panel Assembly to connector J3 on the Connector Panel Assembly. Connector J3 provides +28 Vdc power to the transport.

Fuse F2 on the Connector Panel is a 3 amp SLO-BLO fuse and provides for +28 Vdc short circuit protection to all circuit card indicator lamps. +28 Vdc from fuse F2 is routed through connector J12/P12 to the mother board circuit card assembly for distribution to all circuit card indicator lamps.

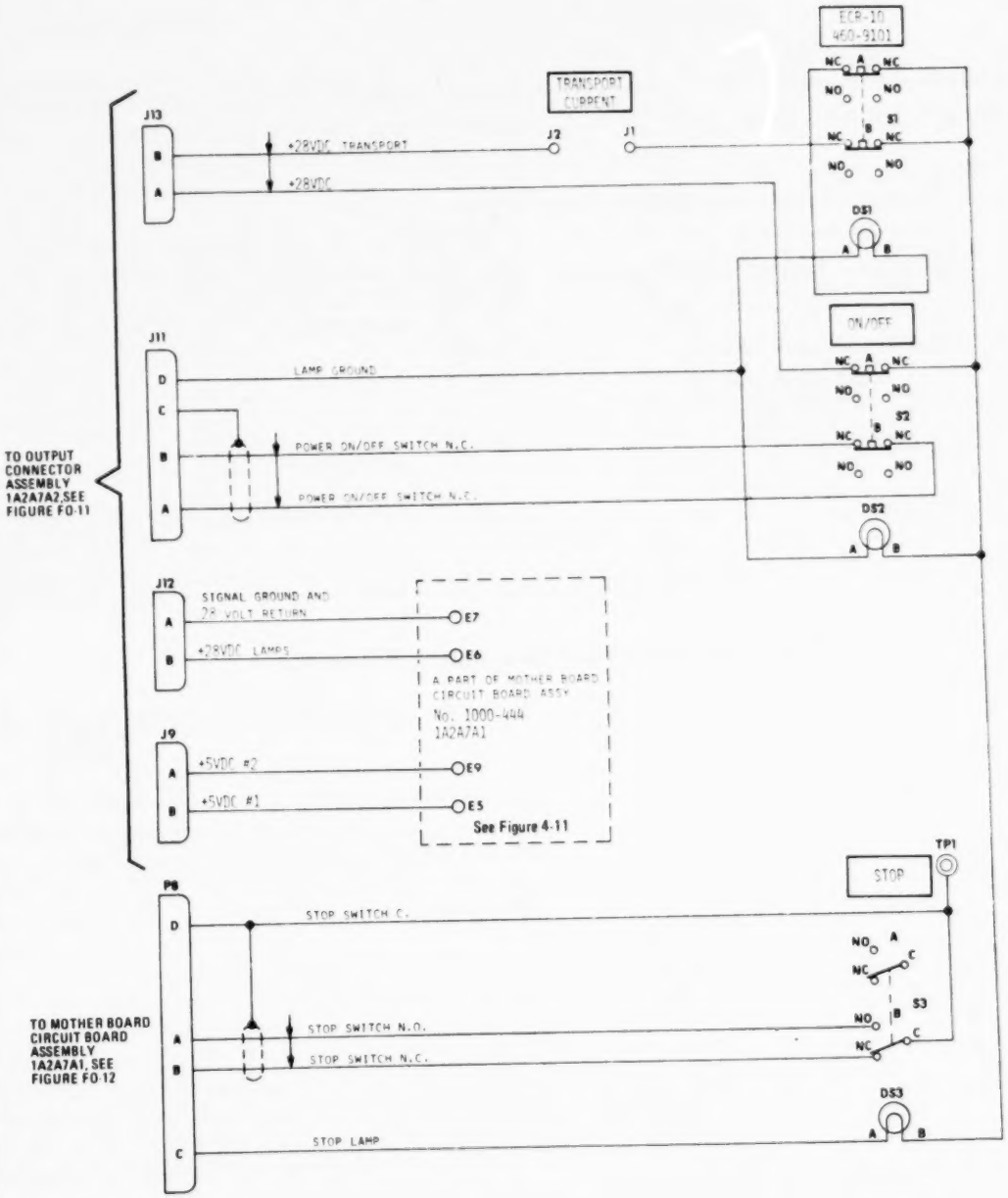


Figure 4-10. Power Switch Assembly (1A2A7A3) Schematic

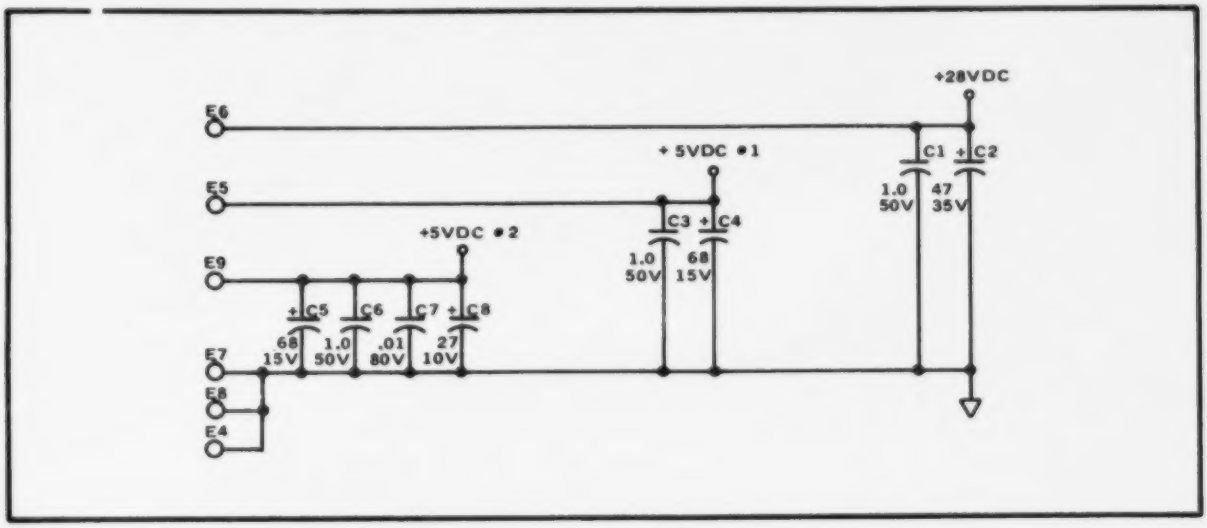


Figure 4-11. Mother Board Decoupling Schematic

SECTION V
MAINTENANCE INSTRUCTIONS

5-1. INTRODUCTION

This section contains the maintenance instructions for the Exerciser. They include routine checks, preventive maintenance services, general cleaning instructions, troubleshooting and removal and replacement procedures.

Organizational maintenance of the Exerciser is limited to replacement of indicator lamps and fuses. Other maintenance procedures must be performed at higher level maintenance.

5-2. TOOLS AND TEST EQUIPMENT

The tools and test equipment allocated for maintenance on the Exerciser are listed in the Maintenance Allocation Chart in Appendix D.

5-3. PREVENTIVE MAINTENANCE PROCEDURES

a. General. Operator and organizational preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to maintain the equipment in serviceable condition.

b. Routine Checks. Routine checks such as: cleaning, dusting, washing, checking for frayed cables, stowing items not in use, covering unused receptacles, and checking for loose nuts and bolts are not listed as preventive maintenance checks or services. These are things that you should do anytime you see they must be done.

c. Preventive Maintenance Checks and Services. Preventive maintenance checks of the Exerciser are not required. However, before operating, depress LAMP TEST switch and observe that all data register status lamps operate. Perform necessary maintenance on non-operating indicator lamps.

5-4. CLEANING

WARNING

USE OF CLEANING SOLVENT

Fumes of TRICHLOROTRIFLUOROETHANE are poisonous. Provide adequate ventilation whenever you use TRICHLOROTRIFLUOROETHANE. Do not use solvent near heat or open flame. TRICHLOROTRIFLUOROETHANE will not burn, but heat changes the gas into poisonous, irritating fumes. DO NOT breathe the fumes or vapors. TRICHLOROTRIFLUOROETHANE dissolves natural skin oils. DO NOT get the solvent on your skin. Use gloves, sleeves and an apron which the solvent cannot penetrate. If the solvent is taken internally, see a doctor immediately.

a. General Cleaning. Use a dry, clean, lint-free cloth or brush to remove dust or dirt. If necessary, moisten the cloth or brush with trichlorotrifluoroethane (FSN 6850-00-105-3084). After cleaning, wipe dry with a clean cloth.

WARNING

Compressed air is dangerous and can cause serious bodily harm. It can also cause mechanical damage to the equipment. Do not use compressed air to dry parts where TRICHLOROTRIFLUOROETHANE has been used.

b. Compressed Air. Dry, compressed air, not to exceed 29 psi, may be used, unless otherwise indicated, to remove dirt and dust from inaccessible places.

5-5. TOUCH-UP PAINTING

Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TB 746-10.

5-6. TROUBLESHOOTING

The troubleshooting concept is based on fault isolation to replace a faulty subassembly with an identical subassembly known to be operating properly. It is the fastest and most reliable method of restoring the equipment to the normal state of operational readiness. Removal and replacement are included for all major subassemblies. All DIP switches on the circuit cards are factory set.

Table 5-1 is a list of trouble symptoms encountered due to malfunction of the Exerciser. Trouble isolation instructions and recommended corrective actions are included next to each symptom listed. These fault indications may be observed while performing the operational procedure given in Section III.

Voltage, resistance and continuity measurements are made by general support level maintenance for troubleshooting faults which cannot be resolved or repaired by organizational level maintenance. Use the wire run lists (Tables 5-2 through 5-10), and foldout diagrams, FO-1 through FO-16, to support this troubleshooting.

Table 5-1. Troubleshooting

Symptom	Probable Cause	Remedy
1. Lights on Motion and Data control other than "Write Reset" and Stop stay on when power is applied.	Processor not started properly.	Press "Processor Reset". If problem continues replace Circuit Card 3. PROCESSOR RESET switch not functioning correctly.
2. Status of Transport incorrect, bad, or inverted.	Clock/Status Board not set up properly.	Check switch settings or replace Circuit Card 1.
3. Block Mode operation intermittent.	Start/Stop switch in test position.	Check switch settings on Clock/Status circuit card or replace Circuit Card 1.
4. Function light does not change when pushed.	Improper operation.	Exerciser must be in "Stop" to change any Motion or Status Command except "Write Reset" when in Run Fwd or Reverse. Press STOP and then reactivate function switch.

Table 5-1. Troubleshooting (Continued)

Symptom	Probable Cause	Remedy
5. Switch indicator lamps do not light.	Faulty lamp or indicator circuit.	Press "Lamp Test". All lamps should light except the "Write Data Selector" lights will not be affected. Replace circuit cards that do not respond.
6. Transport will only run in reverse, all indications functioning.	Processor not set up properly.	a. Set processor switches. b. Replace Circuit Card 3. c. Replace Circuit Card 4.
7. Transport does not respond at all, status or motion.	Unit not selected.	Select switch on unit and Exerciser must agree and power applied (including current sense loop). The door must be closed on the transport.
8. Transport does not respond to all motion commands.	Bad motion control drivers.	Replace Circuit Card 4.
9. Write Data select will not change.	Bad switch on Write Data or Read/Write and error boards.	Replace Circuit Card 5, then replace Circuit Card 6.
10. Data at Write Data test point not correct. Will not change between "PAT.", "0", "1".	Bad data selector.	Replace Circuit Card 5.
11. No output at all from write test point. (Must be in Write and Run Forward.)	Bad selectors or data drivers.	Replace Circuit Card 6.

Table 5-1. Troubleshooting (Continued)

Symptom	Probable Cause	Remedy
12. Insert error not functional.	Error insert circuit. Errors may **only** be inserted while data is being written on tape.	Replace Circuit Card 6.
13. Constant read errors.	Data written or recovered incorrectly. **Note** Attempt to write data all zero with the Parity bit set to Pattern. Then attempt All Pattern to confirm fault.	Replace Circuit Card 6.
14. No sync pulse.	Bad sync driver.	Replace Circuit Card 6.
15. Unit does not respond to Motion Control commands.	Bad start circuit. Input to EXT. START connector must be open or greater than 2.25V. The processor will wait for this condition in Block Mode.	Replace Circuit Card 6.
16. Hard errors greater than Soft errors.	Error flip-flop circuit. **Note** LRC errors will allow this condition.	Replace Circuit Card 6.
17. Errors will not reset.	Bad indicator circuits.	Replace Circuit Card 6.
18. Blower fan does not operate.	a. Blower connector is disconnected. b. Faulty blower.	Attached blower connector (See Figure 5-3, Item 2). Replace blower (see paragraph 5-18).
19. No power to Exerciser circuits.	a. Main fuse (1A1A3F1) is blown. b. Defective power supply.	Replace main fuse (See paragraph 5-23.) Replace power supply.

Table 5-1. Troubleshooting (Continued)

Symptom	Probable Cause	Remedy
20. No power to Transport.	a. Transport 28 Vdc power fuse is blown. b. Current Sense Loop not installed.	Replace fuse 1A2F1 on Output Connector Assembly (see paragraph 5-23.) Install Current Sense Loop or ammeter.
21. 28 Vdc lamps on all circuit cards will not light.	Lamp fuse is blown.	Replace fuse 1A2F2 on Output Connector Assembly (see paragraph 5-23).
22. EOT status light not lit when Transport is at END-OF-TAPE.	a. No status signal from Transport. b. Status logic circuit is defective. c. Defective EOT lamp.	Check Transport signal/ control cable 1000-564. Replace Circuit Card 1. Replace Circuit Card 1.
23. BOT status light not lit when Transport is at BEGINNING-OF-TAPE.	a. Defective EOT lamp. b. Defective status logic circuit. c. No status signal from Transport.	Replace Circuit Card 1. Replace Circuit Card 1. Check Transport signal/ control cable 1000-564.
24. IN REWIND status light not lit when Transport is rewinding.	a. Defective IN REWIND lamp. b. Defective STATUS logic circuit. c. No status signal from Transport.	Replace Circuit Card 1. Replace Circuit Card 1. Check Transport signal/ control cable 1000-564.
25. READY status light not lit.	a. Defective READY lamp. b. Defective status logic circuit. c. No status signal from Transport.	Replace Circuit Card 1. Replace Circuit Card 1. Check Transport signal/ control cable 1000-564.
26. SELECTED status light not lit.	a. Defective SELECTED status lamp. b. Defective status logic circuit. c. No status signal from Transport.	Replace Circuit Card 1. Replace Circuit Card 1. Check Transport signal/ control cable 1000-564.

Table 5-1. Troubleshooting (Continued)

Symptom	Probable Cause	Remedy
27. WRITE ENABLE status light	a. Defective SELECTED status lamp.	Replace Circuit Card 1.
	b. Defective status logic circuit.	Replace Circuit Card 1.
	c. No status signal from Transport.	Check Transport signal/ control cable 1000-564.
28. Exerciser will not read continuous motion (CONT. READ).	a. +5 Vdc #2 fuse (1A1A2F2) is blown	Replace fuse (See paragraph 5-23).
	b. Defective data control circuit.	Replace Circuit Card 2.
	c. No processor command.	Replace Circuit Card 3.
29. Exerciser will not repeat on error.	a. Defective data control circuit.	Replace Circuit Card 2.
	b. No processor command.	Replace Circuit Card 3.
30. Exerciser will not write 4K blocks.	a. +5 Vdc #1 fuse (1A2A2F1) is blown	Replace fuse (See paragraph 5-23).
	b. Defective data control circuit.	Replace Circuit Card 2.
	c. Defective write data control circuits.	Replace Circuit Card 5.
31. Exerciser will not write or read in block mode.	a. +5 Vdc #1 fuse (1A2A2F1) is blown.	Replace fuse (See paragraph 5-23).
	b. Incorrect processor commands.	Replace Circuit Card 3.
	c. Defective format generator circuit.	Replace Circuit Card 1.
	d. Defective data control circuit.	Replace Circuit Card 2.
32. Exerciser will not write shifted ones.	a. +5 Vdc #1 fuse (1A2A2F1) is blown.	Replace fuse (See paragraph 5-23).
	b. Incorrect processor commands.	Replace Circuit Card 3.
	c. Defective write data control circuit.	Replace Circuit Card 2.
	d. Defective write data circuits.	Replace Circuit Card 6.

Table 5-1. Troubleshooting (Continued)

Symptom	Probable Cause	Remedy
33. No WRITE RESET light.	a. +5 Vdc #1 fuse (1A2A2F1) is blown.	Replace fuse (See paragraph 5-23).
	b. Defective WRITE RESET lamp.	Replace Circuit Card 2.
	c. Defective data control circuit.	Replace Circuit Card 2.
	d. Defective format generator write reset circuit.	Replace Circuit Card 1.
34. Exerciser will not write data.	a. +5 Vdc #1 fuse (1A2A2F1) is blown.	Replace fuse (See paragraph 5-23).
	b. Defective data control circuit.	Replace Circuit Card 2.
	c. Defective write data control circuit.	Replace Circuit Card 5.
	d. Defective write data circuit.	Replace Circuit Card 6.
	e. Defective processor commands.	Replace Circuit Card 3.
35. Exerciser will not select the Transport (SELECT 1 through 4).	a. +5 Vdc #2 fuse (1A1A2F2) is blown.	Replace fuse (See paragraph 5-23).
	b. No select signal from Exerciser.	Replace Circuit Card 4.
	c. Faulty processor command.	Replace Circuit Card 3.
	d. Defective control signal cable to Transport.	Replace signal/control cable.
36. Transport will not respond to REWIND pushbutton switch.	a. +5 Vdc #2 fuse (1A1A2F2) is blown.	Replace fuse (See paragraph 5-23).
	b. Defective REWIND switch.	Replace Circuit Card 4.
	c. Defective motion control circuit.	Replace Circuit Card 4.
	d. Defective processor circuit.	Replace Circuit Card 3.

Table 5-1. Troubleshooting (Continued)

Symptom	Probable Cause	Remedy
37. Transport will not respond to FAST pushbutton switch.	a. +5 Vdc #2 fuse (1A1A2F2) is blown.	Replace fuse (See paragraph 5-23).
	b. Defective FAST switch.	Replace Circuit Card 4.
	c. Defective motion control circuit.	Replace Circuit Card 4.
	d. Defective processor circuit.	Replace Circuit Card 3.
38. Transport will not respond to RUN REVERSE switch.	a. +5 Vdc #2 fuse (1A1A2F2) is blown.	Replace fuse (See paragraph 5-23).
	b. Defective RUN REVERSE switch.	Replace Circuit Card 4.
	c. Defective motion control circuit.	Replace Circuit Card 4.
	d. Defective processor circuit.	Replace Circuit Card 3.
39. Transport will not respond to RUN FORWARD switch.	a. +5 Vdc fuse (1A1A2F2) is blown.	Replace fuse (See paragraph 5-23).
	b. Defective RUN FORWARD switch.	Replace Circuit Card 4.
	c. Defective motion control circuit.	Replace Circuit Card 4.
	d. Defective processor circuit.	Replace Circuit Card 3.
40. STOP indicator does not light.	a. Defective STOP lamp.	Replace STOP indicator lamp.
	b. Defective motion control circuit.	Replace Circuit Card 4.
41. Incorrect data pattern generated.	a. Defective write clock circuit.	Replace Circuit Card 1.
	b. Defective processor circuit.	Replace Circuit Card 3.
	c. Defective write data control circuit.	Replace Circuit Card 5.
	d. Defective write data and parity circuit.	Replace Circuit Card 6.
42. EXT. START input does not respond to start pulse.	a. Defective EXT. START circuit.	Replace Circuit Card 6.
	b. Defective processor circuit.	Replace Circuit Card 3.

Table 5-1. Troubleshooting (Continued)

Symptom	Probable Cause	Remedy
43. No soft errors counted.	a. Defective READ circuit. b. Defective processor circuit.	Replace Circuit Card 6. Replace Circuit Card 3.
44. No hard errors counted.	a. Defective error counter circuit. b. Defective processor circuit. c. Defective READ circuit.	Replace Circuit Card 6. Replace Circuit Card 3. Replace Circuit Card 6.

5-7. REPAIR

Repair of the Exerciser involves the removal and replacement of the major subassembly.

5-8. REMOVAL AND REPLACEMENT PROCEDURES

WARNING

Disconnect AC line cord and transport power and signal cables prior to performing removal and replacement procedures.

Be sure that replacement parts are of the correct type, and that they are known to be good. Refer to the Repair Parts and Special Tools List (RPSTL) TM 11-6625-3024-24P for identification of replacement components.

5-9. CIRCUIT CARD REMOVAL

The circuit cards in the Exerciser are supported by card guides and mate with an edge connector on the mother board at the rear of the frame assembly.

Note

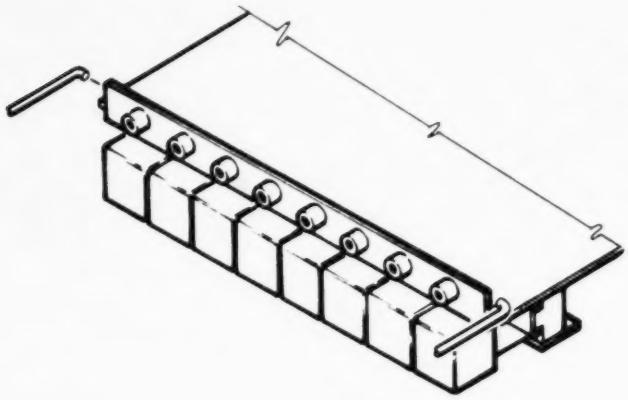
Before removing the front panel, remove the Current Sense Loop.

1. Remove the front panel by removing four screws, four lock washers, and four flat washers (1) on the panel. See Figure FO-13 for circuit card location.

2. Remove the circuit card(s) as illustrated in Figure 5-1.

a. Status and Clock Circuit Card

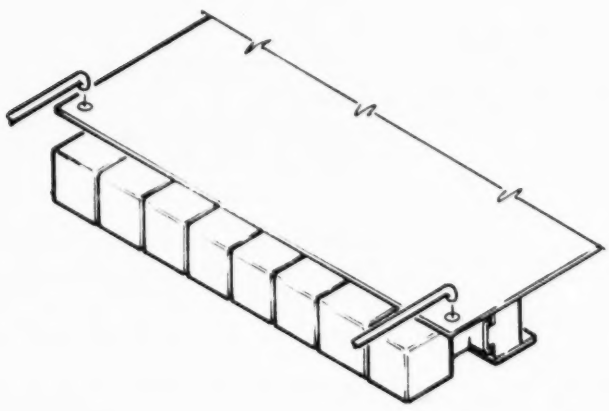
Hook an extractor tool behind test jack panel and pull straight out.



Circuit Card 1
1A2A1

b. Data Control Circuit Card

Hook an extractor tool in end holes on the circuit card and pull straight out.



Circuit Card 2
1A2A2

c. Processor Circuit Card

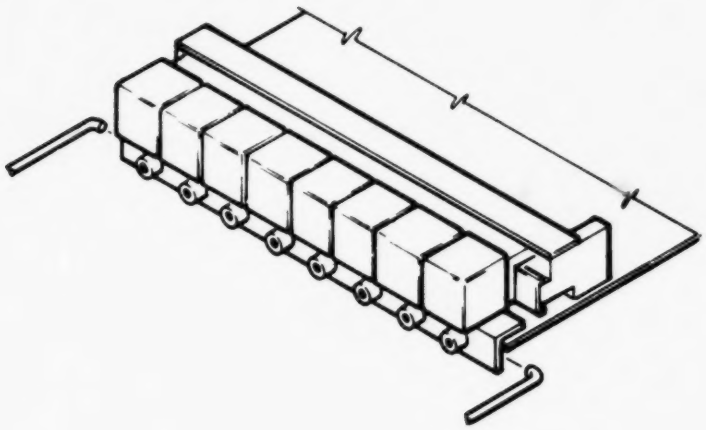
Hook an extractor tool in end holes on the circuit card as shown for Data Control circuit card, and pull straight out.

Circuit Card 3
1A2A3

Figure 5-1. Printed Circuit Card Removal

d. **Motion Control Circuit Card**

Hook an extractor tool behind test jack panel and pull straight out.



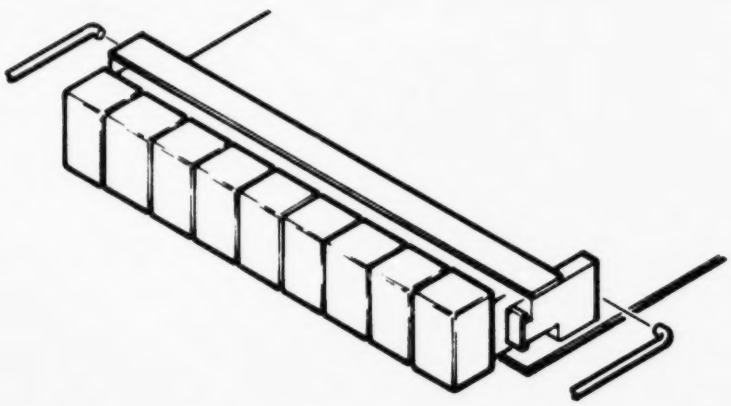
Circuit Card 4
1A2A4

e. **Write Data Control Circuit Card**

Hook an extractor tool behind Write Data Control Switches and pull straight out.

CAUTION

Ensure that extractor tool is behind metal post.

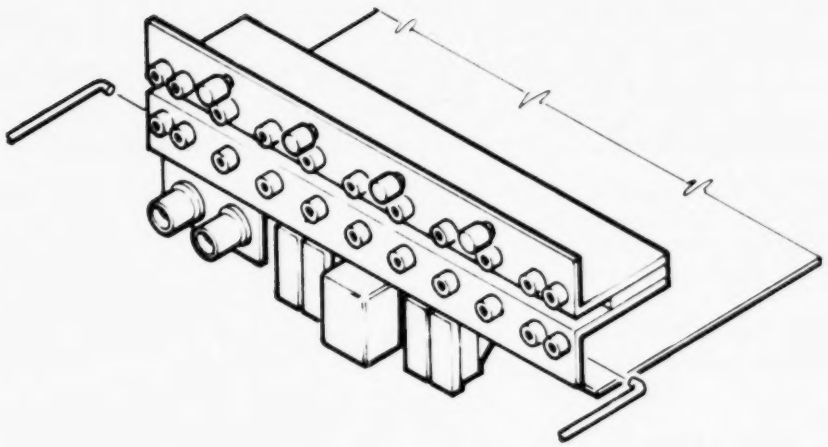


Circuit Card 5
1A2A5

Figure 5-1. Printed Circuit Card Removal (Continued)

f. Read/Write Data and Error

Hook an extractor tool behind Read Data Test jacks and pull straight out.



Circuit Card 6
1A2A6

Figure 5-1. Printed Circuit Card Removal (Continued)

5-10. CIRCUIT CARD REPLACEMENT

1. To install the circuit cards, insert the circuit card in the edge guides. (See Figure FO-13, Circuit Card Location.)

2. Push the circuit card into the frame assembly until it mates with the rear edge connector. A firm pressure on the front edge of the circuit card will engage the rear edge connector.

3. Install the front panel using two screws, lock washers, and flat washers (1) on each side of the panel. (See Figure FO-13, Circuit Card Location.)

5-11. CIRCUIT CARD LAMP REMOVAL

CAUTION

Never operate Exerciser with a lamp missing from a socket.

1. Remove front panel as described in paragraph 5-9.

2. Remove the indicator cover (2) by pulling straight out from the circuit card. (See Figure FO-13.)

3. Remove the lamp(s) (3) from the retaining clip.

5-12. CIRCUIT CARD LAMP REPLACEMENT

1. Install the new lamp(s) in the retaining clip.

CAUTION

Make sure collar on the bulb is properly seated in the contacts. Failure to seat properly will result in transistor driver burn out. See Figure FO-13.

2. Push the indicator cover (2) onto the switch flange.

3. Replace the front panel as described in paragraph 5-10.

5-13. POWER AND STOP SWITCH LAMP REMOVAL

The TRANSPORT and SYSTEM power switches and the STOP switch indicators contain a 28 volt screw base lamp (1). (See Figure 5-2. Power/STOP Switch Assembly.)

1. Remove the front panel as described in paragraph 5-9.

2. Pull the indicator cover (2) straight out. The lamp shield (3) may be removed with the cover.

3. Unscrew the lamp from the lamp socket.

5-14. POWER AND STOP SWITCH LAMP REPLACEMENT

1. Screw the new lamp in the lamp socket.

2. Push and seat the lamp shield and indicator cover over the lamp.

3. Replace the front panel as described in paragraph 5-10.

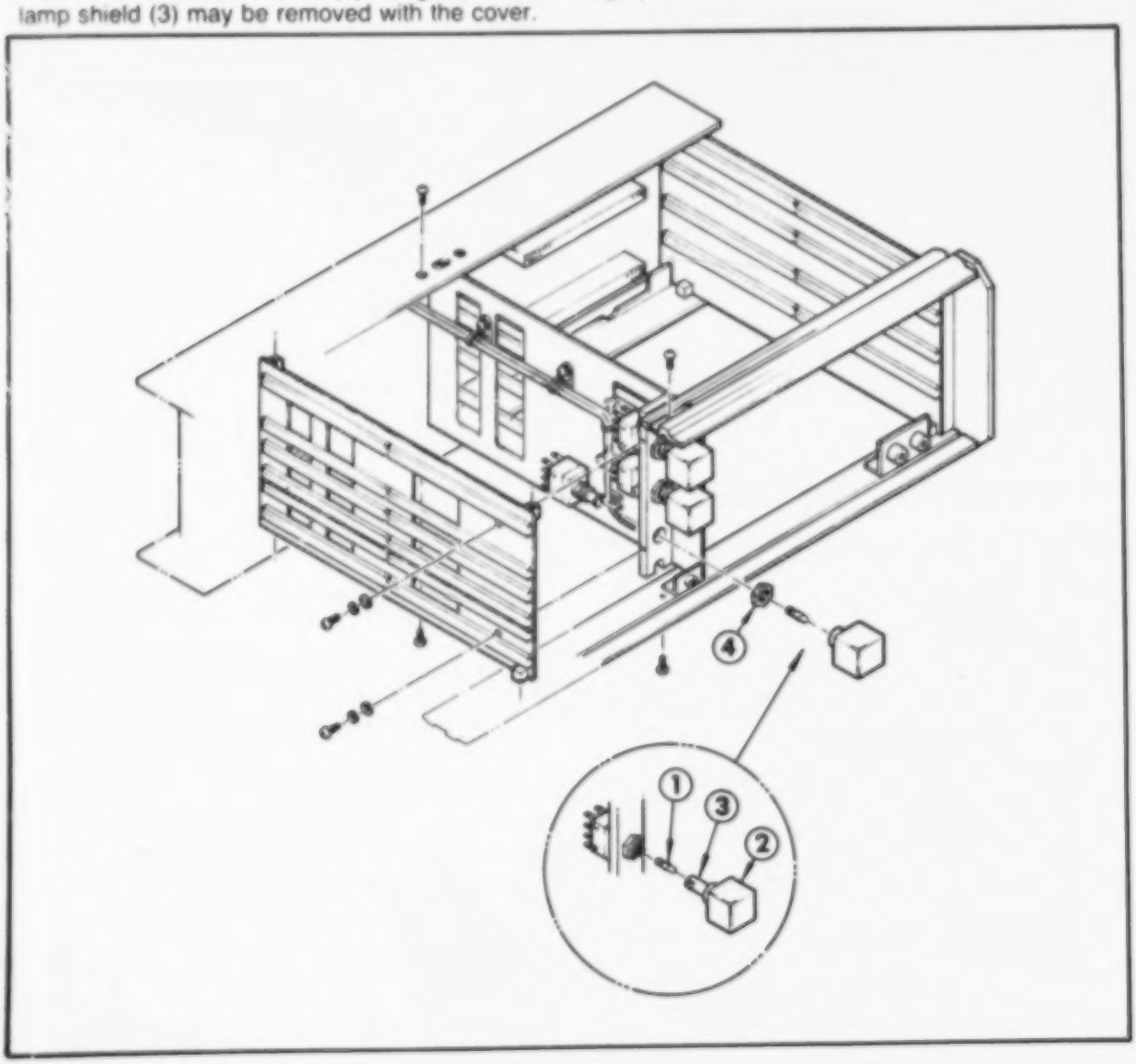


Figure 5-2. Power/STOP Switch Assembly

5-15. POWER SUPPLY REMOVAL

The power supply is attached on the rear of the Exerciser. Refer to Figure 5-3, Power Supply Removal, for the following procedures.

1. Lift the Exerciser by the carrying handle and stand upright on the back side.

2. Open the top and bottom access doors.

3. Remove power supply connector (1) and blower connector (2). The blower connector is a two-prong connector that pulls straight out.

4. Remove four screws (3) on the bottom and four screws (4) on the top.

5. Lift the Exerciser frame assembly straight up off the Power Supply Assembly. The Exerciser side panels will slide out of the power supply frame.

5-16. POWER SUPPLY REPLACEMENT

The power supply slides into the channeled side panels, from the rear, of the Exerciser frame assembly.

1. Place the power supply assembly on a table or bench, with the power receptacle on the right side.

2. Set the Exerciser frame assembly down onto the power supply, allowing the side panels to slide into the channeled sides of the power supply assembly. Ensure that the Exerciser's power plug is also positioned on the right side of the power supply assembly.

3. Install four screws (3) on the bottom and four screws (4) on the top of the Exerciser frame assembly to secure the power supply in place. (See Figure 5-3, Power Supply Removal.)

4. Connect power connector (1) on the right side.

5. Connect blower motor connector (2) on the left side. The blower connector is a two-prong connector that pushes straight in from the top of the Power Supply Assembly.

6. Close the top and bottom access doors.

7. Set the Exerciser on its bottom feet. The Exerciser can now be prepared for operation.

5-17. BLOWER REMOVAL

1. Remove Power Supply Assembly. (See paragraph 5-15, Power Supply Removal.)

2. Remove four attaching hex screws, lock washer, and flat washer (5). (See Figure 5-3, Power Supply Removal, for location of attaching hardware.)

5-18. BLOWER REPLACEMENT

1. Attach blower to the left side panel of the Exerciser frame assembly using four attaching socket head cap screws, lock washer, and flat washer (5). (See Figure 5-3 for proper locations.)

2. Replace Power Supply Assembly following the procedure in paragraph 5-16, Power Supply Replacement.

5-19. POWER STOP SWITCH REMOVAL (Transport Power, System Power, STOP Switches)

The center power switches and STOP switch are mounted between the two center card guide frames. The left card guide frame (viewed from the front) must be removed to gain access to the switches.

1. Remove all circuit cards. (See paragraph 5-9, Circuit Card Removal.

2. Remove Power Supply Assembly. (See paragraph 5-15, Power Supply Removal.)

3. Remove the top panel (8) of the electronic housing assembly by removing 11 attaching screws. The panel will then slide back, out of the side channels. (See Figure FO-14 for attaching hardware.)

4. Remove the dust cover assembly (11) by removing 4 screws along the front edge of hinge bracket.

5. Remove the bottom card frame panel (9) by removing attaching screws at the rear of the panel. The panel will then slide back out of the side channels.

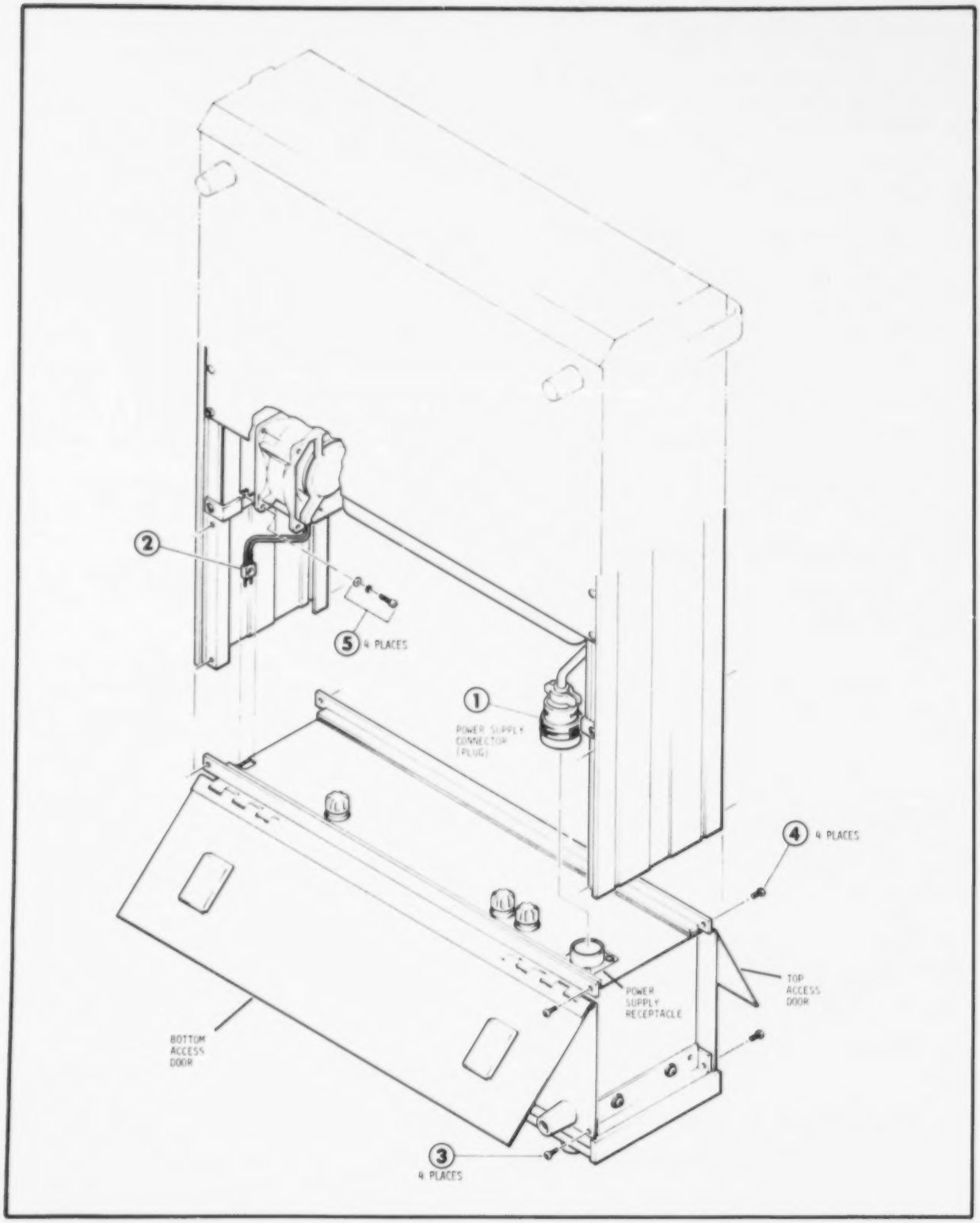


Figure 5-3. Power Supply Removal

To replace the power/STOP switches, only the left-center card guide panel (12) is to be removed. See Figure 5-2, Power/STOP Switch Assembly.

6. Remove the left-center card guide panel (12) by removing 2 attaching screws located on the top and 2 attaching screws located on the bottom. Remove 2 attaching screws and washers on the side of the card guide panel. (See Figure 5-2, Power/STOP Switch Assembly, for attaching hardware location.)

7. The card guide frame can now be removed, gaining access to the three switches.

8. Unsolder the wires from the defective switch. (Label the wires for installation reference.)

9. Remove the lamp cover and lamp shield from the front of the switch. (See paragraph 5-13, Power and STOP Switch Lamp Removal.)

10. Remove the large hex nut (4) on the front of the switch assembly. The defective switch assembly can now be removed from the rear of the attaching frame.

5-20. POWER/STOP SWITCH REPLACEMENT (Transport Power, System Power, STOP Switches)

1. Insert the switch assembly from the back side of the mounting frame. (See Figure 5-2, Power/STOP Switch Assembly.)

2. Install the large hex nut (4) from the front side of the mounting frame.

3. Install the switch lamp cover (2) and shield (3). (See paragraph 5-14, Power and STOP Switch Lamp Replacement.)

4. Attach the wires on the switch terminals.

5. Relace the card guide frame and attach with 2 top screws and 2 bottom screws. (See Figure 5-2, Power/STOP Switch Assembly.)

Note

Do not tighten screws securely until alignment of card guide is made.

6. Install 2 side screws in the side of the card guide frame.

7. Insert circuit card 1A2A1 and circuit card 1A2A4 in the card guides to adjust card guide alignment.

8. Align the card guide frame so that the circuit card slides into the guide evenly and does not bind.

9. Tighten the top and bottom attaching frame screws.

10. Slide the top and bottom card frame panels into place. The panels slide into the side panels from the rear of the frame assembly. (See Figure FO-15.)

11. Install 3 attaching screws on the back of each panel.

12. Replace the dust cover assembly using 4 attaching screws along the front edge of the hinge bracket. (See Figure FO-14 for attaching hardware.)

13. Replace the six circuit cards. (See paragraph 5-10, Circuit Card Replacement.)

14. Replace Power Supply Assembly, following the procedure in paragraph 5-16, Power Supply Replacement.

5-21. CONNECTOR PANEL ASSEMBLY REMOVAL

1. Remove Power Supply Assembly. (See paragraph 5-15, Power Supply Removal.)

2. Remove the top card frame panel by removing 3 attaching screws at the rear of the panel. The panel will then slide back out of the side channels. (See Figure FO-16 for attaching hardware.)

3. Remove the dust cover assembly by removing 4 screws along the front edge hinge bracket.

4. Remove the bottom card frame panel by removing 3 attaching screws at the rear of the panel. The panel will then slide back out of the side channels.

5. Remove 2 attaching screws, lock washers and flat washers, to remove the connector assembly cover (1). (See Figure 5-4, Connector Panel Assembly, for assembly location and attaching hardware.)

6. Remove 6 attaching screws, lock washers and flat washers, to remove the Mother Board cover (2).

7. Remove connector J7 (3) from Mother Board.

8. Remove 2 screws from connectors J9, J11, J12, and J13 (4) and disconnect from connector panel assembly. Remove cable clamp (5) screw, lock washer, and flat washer.

9. Remove 7 attaching screws to remove the connector assembly rear bracket (6).

10. Remove 6 attaching screws along top side of connector panel assembly front bracket (7). (See Figure FO-16 for attaching hardware location.)

11. The connector panel assembly can now be removed.

5-22. CONNECTOR PANEL ASSEMBLY REPLACEMENT

1. Install the connector panel assembly using 6 attaching screws along the top side of the connector panel assembly front bracket (7). (See Figure 5-4, Connector Panel Assembly and Figure FO-16 for attaching hardware.)

2. Install the rear bracket (6) using 7 attaching screws.

3. Install connectors J9, J11, J12, and J13 using 2 screws (4). Install cable clamp using one screw (5).

4. Install connector J7 (3) on Mother Board.

5. Install Mother Board cover (2) using 6 attaching screws.

6. Install connector assembly cover (1) using 2 attaching screws.

7. Slide the top and bottom card frame panels into place. The panels slide into the side panels from the rear of the frame assembly. (See Figure FO-15.)

8. Install 3 attaching screws on the back of each panel.

9. Replace the dust cover assembly using 6 attaching screws along the front edge of the hinge bracket.

10. Replace Power Supply Assembly, following the procedures in paragraph 5-16, Power Supply Replacement.

5-23. FUSE REMOVAL AND REPLACEMENT

1. Fuses 1A2F1 and 1A2F2. To remove and replace the +28 volt transport power fuse 1A2F1 (5 amp SLO-BLOW) and the 28 volt Exerciser lamps fuse 1A2F2 (3 amp SLO-BLOW), open the bottom access door located under the cabinet. (See Figure FO-15.)

2. Fuses 1A1A3F1, 1A1A2F1 and 1A1A2F2. To remove and replace the main fuse 1A1A3F1 (5 amp SLO-BLOW), the +5 Vdc #1 fuse 1A1A2F1 (4 amp SLO-BLOW) and the +5 Vdc #2 fuse 1A1A2F2 (4 amp SLO-BLOW), open the top access door located on the top of the cabinet. (See Figure FO-15.)

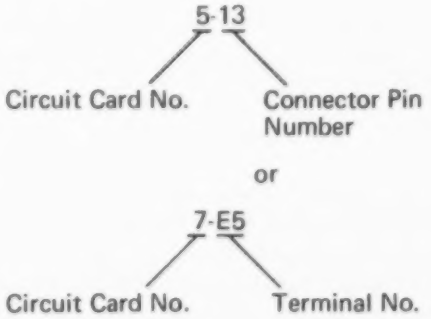
5-24. SCHEMATIC NOTES

1. All resistors on schematic diagrams identified with a "U" reference designator are part of a dual-in-line resistor pack.

2. Assembly unit or subassembly unit prefix is not shown on reference designators, i.e., R1 = 1A1A2R1.

3. Input and output signal destinations are shown at the connector as circuit card number and connector pin number.

Example:



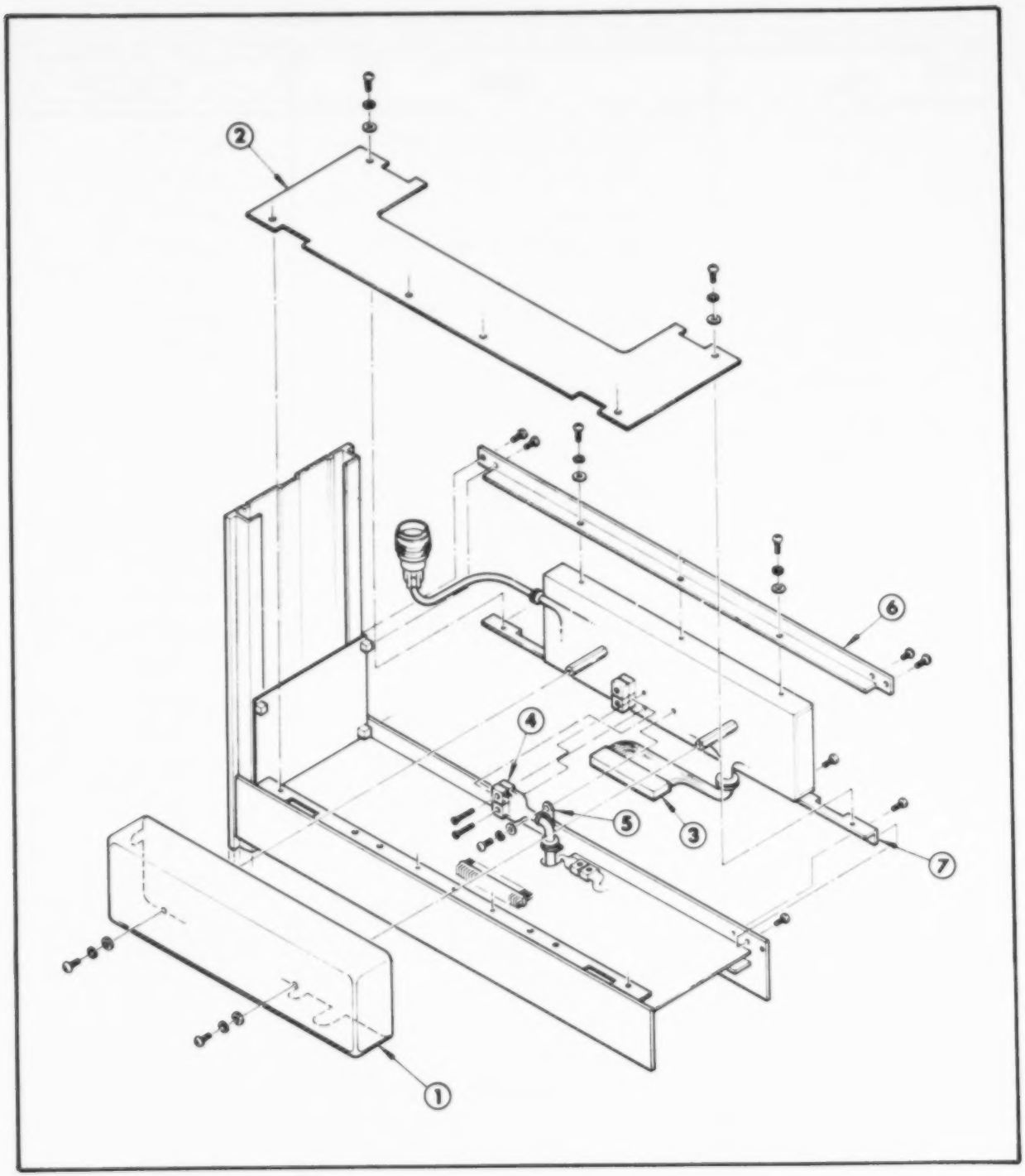


Figure 5-4. Connector Panel Assembly

Table 5-2. Mother Board Wire List, Connector J1

From	Signal	To
J1-1	SIG. GND.	E-7
J1-2	SIG. GND.	E-7
J1-3	SIG. GND.	E-7
J1-4	SIG. GND.	E-7
J1-5	Time	J3-5
J1-6	$\overline{\text{END BLOCK}}$	J5-60
J1-7	+5V #1	E-5
J1-8	+5V #1	E-5
J1-9	+5V #1	E-5
J1-10	+5V #1	E-5
J1-11	$\overline{\text{DELAY ENABLE}}$	J3-40
J1-12	$\overline{\text{CRC WORD}}$	J6-44
J1-13	CLOCK 1.25 MHz	J3-46
J1-14	(NOT USED)	
J1-15	$\overline{\text{WRITE RESET, 1}}$	J2-29
J1-16		
J1-17		
J1-18		
J1-19		
J1-20		
J1-21		
J1-22	$\overline{\text{LAMP TEST}}$	J2-22, J4-22, J6-74, & J7-2
J1-23	$\overline{\text{WRITE RESET, 4}}$	J2-28
J1-24	$\overline{\text{READ CLOCK}}$	J6-43
J1-25		
J1-26	CLOCK WP	J5-41 & J6-42
J1-27	REWIND STATUS	J3-48
J1-28		
J1-29	BOT STATUS	J3-47

Table 5-2. Mother Board Wire List, Connector J1 (Continued)

From	Signal	To
J1-30	READY STATUS	J3-50
J1-31	EOT STATUS	J3-49
J1-32		
J1-33	READY N.G. STATUS	J3-52
J1-34		
J1-35	ON LINE STATUS	J3-51
J1-36		
J1-37	WRITE PROTECT STATUS	J3-53
J1-38		
J1-39	$\overline{\text{READY N.G.}}$	J7-38
J1-40	$\overline{\text{ON LINE}}$	J7-36
J1-41	$\overline{\text{READY}}$	J7-40
J1-42		
J1-43	$\overline{\text{BOT}}$	J7-44
J1-44	$\overline{\text{IN REWIND}}$	J7-42
J1-45		
J1-46		
J1-47	$\overline{\text{EOT}}$	J7-48
J1-48	$\overline{\text{WRITE RESET, 2}}$	J7-46
J1-49	$\overline{\text{WRITE PROTECT}}$	J7-50
J1-50		
J1-51		
J1-52	$\overline{\text{IN REWIND 2}}$	J4-51
J1-53	SPARE TO OUTPUT	J7-52
J1-54		
J1-55		
J1-56		
J1-57	$\overline{\text{SHORT GAP}}$	J3-85
J1-58		
J1-59	$\overline{\text{WRITE RESET, 3}}$	J3-91

Table 5-2. Mother Board Wire List, Connector J1 (Continued)

From	Signal	To
J1-60		
J1-61	LONG GAP	J3-98
J1-62		
J1-63	+28V LAMPS	E-6
J1-64	+28V LAMPS	E-6
J1-65	+28V LAMPS	E-6
J1-66	+28V LAMPS	E-6
J1-67	DATA SENSE	J3-95 & J1-68
J1-68	DATA SENSE	J3-95 & J1-67
J1-69	LAMP GND	E-7
J1-70	LAMP GND	E-7
J1-71	LAMP GND	E-7
J1-72	LAMP GND	E-7

Table 5-3. Mother Board Wire List, Connector J2

From	Signal	To
J2-1	SIG. GND	E-7
J2-2	SIG. GND	E-7
J2-3	SIG. GND	E-7
J2-4	SIG. GND	E-7
J2-5		
J2-6		
J2-7	+5V #2	E-9
J2-8	+5V #2	E-9
J2-9	+5V #2	E-9
J2-10	+5V #2	E-9
J2-11		
J2-12		
J2-13		
J2-14		
J2-15		
J2-16		
J2-17		
J2-18		
J2-19		
J2-20		
J2-21		
J2-22	$\overline{\text{LAMP TEST}}$	J1-22, J4-22, J6-74 & J7-2
J2-23		
J2-24		
J2-25		
J2-26		
J2-27		
J2-28	$\overline{\text{WRITE RESET, 4}}$	J1-23

Table 5-3. Mother Board Wire List, Connector J2 (Continued)

From	Signal	To
J2-29	$\overline{\text{WRITE RESET, 1}}$	J1-15
J2-30		
J2-31		
J2-32	$\overline{\text{WRITE IND.}}$	J3-88
J2-33		
J2-34	$\overline{\text{WRITE S.}}$	J3-38
J2-35		
J2-36	$\overline{\text{CLEAR F/F}}$	J3-36
J2-37		
J2-38		
J2-39		
J2-40		
J2-41		
J2-42		
J2-43		
J2-44		
J2-45		
J2-46		
J2-47	$\overline{\text{WRITE R.}}$	J3-37
J2-48		
J2-49	$\overline{\text{PULSE INPUT 2}}$	J3-78, J4-49
J2-50	$\overline{\text{PULSE INPUT 3}}$	J3-39
J2-51		
J2-52		
J2-53		
J2-54		
J2-55	$\overline{\text{4K BLOCK IND.}}$	J5-53
J2-56	$\overline{\text{READ IND.}}$	J3-11
J2-57		

Table 5-3. Mother Board Wire List, Connector J2 (Continued)

From	Signal	To
J2-58	$\overline{\text{REPEAT ON ERROR IND.}}$	J3-54
J2-59		
J2-60	$\overline{\text{BLOCK MODE IND.}}$	J3-55
J2-61		
J2-62		
J2-63	+28V LAMPS	E-6
J2-64	+28V LAMPS	E-6
J2-65	+28V LAMPS	E-6
J2-66	+28V LAMPS	E-6
J2-67		
J2-68	$\overline{\text{SHIFT ONES IND.}}$	J6-90
J2-69	LAMP GND	E-7
J2-70	LAMP GND	E-7
J2-71	LAMP GND	E-7
J2-72	LAMP GND	E-7

Table 5-4. Mother Board Wire List, Connector J3

From	Signal	To
J3-1	SIG. GND.	E-7
J3-2	SIG. GND.	E-7
J3-3	SIG. GND.	E-7
J3-4	SIG. GND.	E-7
J3-5	TIME	J1-5
J3-6		
J3-7	+5V #2	E-9
J3-8	+5V #2	E-9
J3-9	+5V #2	E-9
J3-10	+5V #2	E-9
J3-11	$\overline{\text{READ IND.}}$	J2-56
J3-12		
J3-13	RESET SW. N.O.	J7-29
J3-14	RESET SW. N.C.	J7-31
J3-15		
J3-16		
J3-17		
J3-18		
J3-19		
J3-20		
J3-21		
J3-22		
J3-23		
J3-24		
J3-25		
J3-26		
J3-27		
J3-28		
J3-29	ENABLE ERROR	J6-83
J3-30	$\overline{\text{COUNT HARD ERROR}}$	J6-76

Table 5-4. Mother Board Wire List, Connector J3 (Continued)

From	Signal	To
J3-31	$\overline{\text{CLEAR GAP}}$	J1-14
J3-32	$\overline{\text{CLEAR ERROR}}$	J6-79
J3-33		
J3-34		
J3-35	$\overline{\text{CLEAR DATA GEN.}}$	J5-56
J3-36	$\overline{\text{CLEAR F/F}}$	J2-36
J3-37	$\overline{\text{WRITE R.}}$	J2-47
J3-38	$\overline{\text{WRITE S.}}$	J2-34
J3-39	$\overline{\text{PULSE INPUT 3}}$	J2-50
J3-40	$\overline{\text{DELAY ENABLE}}$	J1-11
J3-41		
J3-42	$\overline{\text{COUNT SOFT ERROR}}$	J6-88
J3-43		
J3-44		
J3-45		
J3-46	CLOCK 1.25 MHz	J1-13
J3-47	BOT STATUS	J1-29
J3-48	REWIND STATUS	J1-27
J3-49	EOT STATUS	J1-31
J3-50	READY STATUS	J1-30
J3-51	ON LINE STATUS	J1-35
J3-52	READY N.G. STATUS	J1-33
J3-53	WRITE PROTECT STATUS	J1-37
J3-54	$\overline{\text{REPEAT ON ERROR IND.}}$	J2-58
J3-55	$\overline{\text{BLOCK MODE IND.}}$	J2-60
J3-56	END BLOCK	J5-55
J3-57	$\overline{\text{REMOTE START 1}}$	J6-85
J3-58	$\overline{\text{REMOTE START 2}}$	J6-86
J3-59	$\overline{\text{ERROR}}$	J6-77
J3-60	FAST	J4-31

Table 5-4. Mother Board Wire List, Connector J3 (Continued)

From	Signal	To
J3-61		
J3-62		
J3-63		
J3-64	$\overline{\text{SELECT 2 R.}}$	J4-35
J3-65	$\overline{\text{SELECT 3 R.}}$	J4-38
J3-66	$\overline{\text{SELECT 1 R.}}$	J4-37
J3-67	$\overline{\text{REWIND R.}}$	J4-40
J3-68	$\overline{\text{FAST R.}}$	J4-39
J3-69	$\overline{\text{RUN REVERSE S.}}$	J4-42
J3-70	$\overline{\text{RUN REVERSE R.}}$	J4-41
J3-71	$\overline{\text{RUN FORWARD S.}}$	J4-44
J3-72	$\overline{\text{RUN FORWARD R.}}$	J4-43
J3-73	$\overline{\text{STOP S.}}$	J4-46
J3-74	$\overline{\text{STOP R.}}$	J4-45
J3-75		
J3-76	$\overline{\text{SELECT 4 R.}}$	J4-47
J3-77	$\overline{\text{PULSE INPUT 1}}$	J4-50
J3-78	$\overline{\text{PULSE INPUT 2}}$	J2-49 & J4-49
J3-79	$\overline{\text{SYNC}}$	J6-82
J3-80	REWIND	J4-17
J3-81	$\overline{\text{WRITE CLOCK ENABLE}}$	J5-54
J3-82	$\overline{\text{RUN FORWARD IND.}}$	J4-53
J3-83		
J3-84	$\overline{\text{RUN REVERSE IND.}}$	J4-56
J3-85	$\overline{\text{SHORT GAP}}$	J1-57
J3-86	$\overline{\text{REWIND IND.}}$	J4-55
J3-87	$\overline{\text{FAST IND.}}$	J4-58
J3-88	$\overline{\text{WRITE IND.}}$	J2-32
J3-89	$\overline{\text{ENABLE}}$	J6-80

Table 5-4. Mother Board Wire List, Connector J3 (Continued)

From	Signal	To
J3-90	RUN REVERSE	J4-6
J3-91	$\overline{\text{WRITE RESET, 3}}$	J1-59
J3-92	RUN FORWARD	J4-5
J3-93	WRITE	J4-20
J3-94	$\overline{\text{STOP IND.}}$	J4-59
J3-95	DATA SENSE	J1-67 & J1-68
J3-96	$\overline{\text{SELECT 2 IND.}}$	J4-60
J3-97	$\overline{\text{SELECT 1 IND.}}$	J4-68
J3-98	LONG GAP	J1-61
J3-99	READ	J4-15
J3-100	$\overline{\text{LRC CHECK}}$	J6-81

Table 5-5. Mother Board Wire List, Connector J4

From	Signal	To
J4-1	SIG. GND.	E-7
J4-2	SIG. GND.	E-7
J4-3	SIG. GND.	E-7
J4-4	SIG. GND.	E-7
J4-5	RUN FORWARD	J3-92
J4-6	RUN REVERSE	J3-90
J4-7	+5V #2	E-9
J4-8	+5V #2	E-9
J4-9	+5V #2	E-9
J4-10	+5V #2	E-9
J4-11	$\overline{\text{RUN FORWARD}}$	J7-41
J4-12	$\overline{\text{RUN REVERSE}}$	J7-43
J4-13	$\overline{\text{REWIND}}$	J7-39
J4-14	$\overline{\text{FAST}}$	J7-45
J4-15	READ	J3-99
J4-16	$\overline{\text{READ}}$	J7-27
J4-17	REWIND	J3-80
J4-18	$\overline{\text{SELECT 1}}$	J7-49
J4-19	$\overline{\text{WRITE}}$	J7-37
J4-20	WRITE	J3-93
J4-21	$\overline{\text{SELECT 2}}$	J7-51 & J7-47
J4-22	$\overline{\text{LAMP TEST}}$	J1-22, J2-22, J6-74 & J7-2
J4-23	STOP SW. N.O.	E-1
J4-24	STOP SW. N.C.	E-2
J4-25	$\overline{\text{SELECT 3}}$	J7-35
J4-26	STOP LAMP	E-3
J4-27	$\overline{\text{SELECT 4}}$	J7-33
J4-28		

Table 5-5. Mother Board Wire List, Connector J4 (Continued)

From	Signal	To
J4-29		
J4-30		
J4-31	FAST	J3-60
J4-32		
J4-33		
J4-34		
J4-35	$\overline{\text{SELECT 2 R.}}$	J3-64
J4-36		
J4-37	$\overline{\text{SELECT 1 R.}}$	J3-66
J4-38	$\overline{\text{SELECT 3 R.}}$	J3-65
J4-39	$\overline{\text{FAST R.}}$	J3-68
J4-40	$\overline{\text{REWIND R.}}$	J3-67
J4-41	$\overline{\text{RUN REVERSE R.}}$	J3-70
J4-42	$\overline{\text{RUN REVERSE S.}}$	J3-69
J4-43	$\overline{\text{RUN FORWARD R.}}$	J3-72
J4-44	$\overline{\text{RUN FORWARD S.}}$	J3-71
J4-45	$\overline{\text{STOP R.}}$	J3-74
J4-46	$\overline{\text{STOP S.}}$	J3-73
J4-47	$\overline{\text{SELECT 4 R.}}$	J3-76
J4-48		
J4-49	$\overline{\text{PULSE INPUT 2}}$	J2-49 & J3-78
J4-50	$\overline{\text{PULSE INPUT 1}}$	J3-77
J4-51	$\overline{\text{IN REWIND 2}}$	J1-52
J4-52		
J4-53	$\overline{\text{RUN FORWARD IND.}}$	J3-82
J4-54		
J4-55	$\overline{\text{REWIND IND.}}$	J3-86
J4-56	$\overline{\text{RUN REVERSE IND.}}$	J3-84
J4-57		
J4-58	$\overline{\text{FAST IND.}}$	J3-87

Table 5-5. Mother Board Wire List, Connector J4 (Continued)

From	Signal	To
J4-59	$\overline{\text{STOP IND.}}$	J3-94
J4-60	$\overline{\text{SELECT 2 IND.}}$	J3-96
J4-61		
J4-62		
J4-63	+28V LAMPS	E-6
J4-64	+28V LAMPS	E-6
J4-65	+28V LAMPS	E-6
J4-66	+28V LAMPS	E-6
J4-67		
J4-68	$\overline{\text{SELECT 1 IND.}}$	J3-97
J4-69	LAMP GND.	E-7
J4-70	LAMP GND.	E-7
J4-71	LAMP GND.	E-7
J4-72	LAMP GND.	E-7

Table 5-6. Mother Board Wire List, Connector J5

From	Signal	To
J5-1	LAMP GND.	E-7
J5-2	LAMP GND.	E-7
J5-3	LAMP GND.	E-7
J5-4	LAMP GND.	E-7
J5-5		
J5-6		
J5-7	+28V LAMPS	E-6
J5-8	+28V LAMPS	E-6
J5-9	+28V LAMPS	E-6
J5-10	+28V LAMPS	E-6
J5-11	ALL "P" SW. N.C.	J6-12
J5-12	PARITY	J6-11
J5-13	ALL "P" SW. N.O.	J6-14
J5-14	WC6	J6-13
J5-15	ALL "0" SW. N.C.	J6-16
J5-16	WC7	J6-15
J5-17	ALL "0" SW. N.O.	J6-18
J5-18	WC4	J6-17
J5-19	ALL "1" SW. N.C.	J6-20
J5-20	WC5	J6-19
J5-21		
J5-22		
J5-23		
J5-24		
J5-25		
J5-26		
J5-27		
J5-28		
J5-29	ALL "1" SW. N.O.	J6-30
J5-30	WC2	J6-29

Table 5-6. Mother Board Wire List, Connector J5 (Continued)

From	Signal	To
J5-31	WCNT1	J6-32
J5-32	WC3	J6-31
J5-33	WCNT2	J6-34
J5-34	WC0	J6-33
J5-35	WCNT3	J6-36
J5-36	WC1	J6-35
J5-37	WCNT4	J6-38
J5-38	WPT	J6-37
J5-39	WCNT0	J6-40
J5-40	$\overline{\text{CLOCK WP1}}$	J6-39
J5-41	CLOCK WP	J1-26 & J6-42
J5-42		
J5-43		
J5-44		
J5-45		
J5-46		
J5-47		
J5-48		
J5-49		
J5-50		
J5-51		
J5-52		
J5-53	$\overline{\text{4K BLOCK IND.}}$	J2-55
J5-54	$\overline{\text{WRITE CLOCK ENABLE}}$	J3-81
J5-55	END BLOCK	J3-56
J5-56	$\overline{\text{CLEAR DATA GEN.}}$	J3-35
J5-57		
J5-58		
J5-59		

Table 5-6. Mother Board Wire List, Connector J5 (Continued)

From	Signal	To
J5-60	$\overline{\text{END BLOCK}}$	J1-6
J5-61		
J5-62		
J5-63	+5V #1	E-5
J5-64	+5V #1	E-5
J5-65	+5V #1	E-5
J5-66	+5V #1	E-5
J5-67	TEST	J5-68
J5-68	TEST	J5-67
J5-69	LAMP GND.	E-7
J5-70	LAMP GND.	E-7
J5-71	LAMP GND.	E-7
J5-72	LAMP GND.	E-7

Table 5-7. Mother Board Wire List, Connector J6

From	Signal	To
J6-1	LAMP GND.	E-7
J6-2	LAMP GND.	E-7
J6-3	LAMP GND.	E-7
J6-4	LAMP GND.	E-7
J6-5		
J6-6		
J6-7	+28 V LAMPS	E-6
J6-8	+28 V LAMPS	E-6
J6-9	+28 V LAMPS	E-6
J6-10	+28 V LAMPS	E-6
J6-11	PARITY	J5-12
J6-12	ALL "P" SW. N.C.	J5-11
J6-13	WC6	J5-14
J6-14	ALL "P" SW. N.O.	J5-13
J6-15	WC7	J5-16
J6-16	ALL "0" SW. N.C.	J5-15
J6-17	WC4	J5-18
J6-18	ALL "0" SW. N.O.	J5-17
J6-19	WC5	J5-20
J6-20	ALL "1" SW. N.C.	J5-19
J6-21		
J6-22		
J6-23		
J6-24		
J6-25		
J6-26		
J6-27		
J6-28		
J6-29	WC2	J5-30
J6-30	ALL "1" SW. N.O.	J5-29

Table 5-7. Mother Board Wire List, Connector J6 (Continued)

From	Signal	To
J6-31	WC3	J5-32
J6-32	WCNT1	J5-31
J6-33	WC0	J5-34
J6-34	WCNT2	J5-33
J6-35	WC1	J5-36
J6-36	WCNT3	J5-35
J6-37	WPT	J5-38
J6-38	WCNT4	J5-37
J6-39	$\overline{\text{CLOCK WP1}}$	J5-40
J6-40	WCNT0	J5-39
J6-41		
J6-42	CLOCK WP	J1-26 & J5-41
J6-43	$\overline{\text{READ CLOCK}}$	J1-24
J6-44	$\overline{\text{CRC WORD}}$	J1-12
J6-45		
J6-46		
J6-47		
J6-48		
J6-49		
J6-50		
J6-51		
J6-52		
J6-53	WRITE DATA 2^3	J7-19
J6-54	WRITE DATA 2^1	J7-22
J6-55	WRITE DATA PARITY	J7-17
J6-56	WRITE DATA 2^2	J7-20
J6-57	WRITE DATA 2^0	J7-15
J6-58	WRITE DATA 2^7	J7-18

Table 5-7. Mother Board Wire List, Connector J6 (Continued)

From	Signal	To
J6-59	WRITE DATA 2^5	J7-13
J6-60	WRITE DATA 2^6	J7-16
J6-61	WRITE DATA 2^4	J7-11
J6-62	WRITE DATA CLOCK	J7-14
J6-63	READ DATA 2^1	J7-9
J6-64	READ DATA 2^6	J7-12
J6-65	READ DATA 2^0	J7-7
J6-66	READ DATA 2^3	J7-10
J6-67	READ DATA 2^7	J7-5
J6-68	READ DATA 2^2	J7-8
J6-69	READ DATA PARITY	J7-3
J6-70	READ DATA CLOCK	J7-6
J6-71	READ DATA 2^5	J7-1
J6-72	READ DATA 2^4	J7-4
J6-73		
J6-74	$\overline{\text{LAMP TEST}}$	J1-22, J2-22, J4-22 & J7-2
J6-75		
J6-76	$\overline{\text{COUNT HARD ERROR}}$	J3-30
J6-77	$\overline{\text{ERROR}}$	J3-59
J6-78		
J6-79	$\overline{\text{CLEAR ERROR}}$	J3-32
J6-80	$\overline{\text{ENABLE}}$	J3-89
J6-81	$\overline{\text{LRC CHECK}}$	J3-100
J6-82	$\overline{\text{SYNC}}$	J3-79
J6-83	ENABLE ERROR	J3-29
J6-84		

Table 5-7. Mother Board Wire List, Connector J6 (Continued)

From	Signal	To
J6-85	$\overline{\text{REMOTE START 1}}$	J3-57
J6-86	$\overline{\text{REMOTE START 2}}$	J3-58
J6-87		
J6-88	$\overline{\text{COUNT SOFT ERROR}}$	J3-42
J6-89		
J6-90	$\overline{\text{SHIFTED ONES IND.}}$	J2-68
J6-91	+5V#1	E-5
J6-92	+5V#1	E-5
J6-93	+5V#1	E-5
J6-94	+5V#1	E-5
J6-95		
J6-96		
J6-97	SIG. GND.	E-7
J6-98	SIG. GND.	E-7
J6-99	SIG. GND.	E-7
J6-100	SIG. GND.	E-7

Table 5-8. Mother Board Wire List, Connector J7

From	Signal	To
J7-1	READ DATA 2^5	J6-71
J7-2	$\overline{\text{LAMP TEST}}$	J1-22, J2-22, J4-22 & J6-74
J7-3	READ DATA PARITY	J6-69
J7-4	READ DATA 2^4	J6-72
J7-5	READ DATA 2^7	J6-67
J7-6	READ DATA CLOCK	J6-70
J7-7	READ DATA 2^0	J6-65
J7-8	READ DATA 2^2	J6-68
J7-9	READ DATA 2^1	J6-63
J7-10	READ DATA 2^3	J6-66
J7-11	WRITE DATA 2^4	J6-61
J7-12	READ DATA 2^6	J6-64
J7-13	WRITE DATA 2^5	J6-59
J7-14	WRITE DATA CLOCK	J6-62
J7-15	WRITE DATA 2^0	J6-57
J7-16	WRITE DATA 2^6	J6-60
J7-17	WRITE DATA PARITY	J6-55
J7-18	WRITE DATA 2^7	J6-58
J7-19	WRITE DATA 2^3	J6-53
J7-20	WRITE DATA 2^2	J6-56
J7-21		
J7-22	WRITE DATA 2^1	J6-54
J7-23		
J7-24	PROCESSOR RESET AND LAMP TEST GND.	E-7
J7-25		
J7-26		
J7-27	$\overline{\text{READ}}$	J4-16
J7-28		
J7-29	RESET SW. N.O.	J3-13

Table 5-8. Mother Board Wire List, Connector J7 (Continued)

From	Signal	To
J7-30		
J7-31	RESET SW. N.C.	J3-14
J7-32		
J7-33	$\overline{\text{SELECT 4}}$	J4-27
J7-34		
J7-35	$\overline{\text{SELECT 3}}$	J4-25
J7-36	$\overline{\text{ON LINE}}$	J1-40
J7-37	$\overline{\text{WRITE}}$	J4-19
J7-38	$\overline{\text{READY N.G.}}$	J1-39
J7-39	$\overline{\text{REWIND}}$	J4-13
J7-40	$\overline{\text{READY}}$	J1-41
J7-41	$\overline{\text{RUN FORWARD}}$	J4-11
J7-42	$\overline{\text{IN REWIND}}$	J1-44
J7-43	$\overline{\text{RUN REVERSE}}$	J4-12
J7-44	$\overline{\text{BOT}}$	J1-43
J7-45	$\overline{\text{FAST}}$	J4-14
J7-46	$\overline{\text{WRITE RESET. 2}}$	J1-48
J7-47	$\overline{\text{SELECT 2}}$	J4-21 & J7-51
J7-48	$\overline{\text{EOT}}$	J1-47
J7-49	$\overline{\text{SELECT 1}}$	J4-18
J7-50	$\overline{\text{WRITE PROTECT}}$	J1-49
J7-51	$\overline{\text{SELECT 2}}$	J4-21 & J7-47
J7-52	SPARE TO BD #1	J1-53

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Table 5-9. Mother Board Wire List, Connector J8

From	Signal	To
J8-A	STOP SWITCH N.O.	E-1
J8-B	STOP SWITCH N.C.	E-2
J8-C	STOP LAMP	E-3
J8-D	STOP SWITCH C.	E-4

Table 5-10. Mother Board Decoupling

From	Signal	To
E1	STOP SWITCH N.O	J4-23
E2	STOP SWITCH N.C.	J4-24
E3	STOP LAMP	J4-26
E4	STOP SWITCH C.	E-7
E5	+5V #1	See Wire List
E6	+28V	See Wire List
E7	GND.	See Wire List
E8	GND.	E7
E9	+5V #2	See Wire List

APPENDIX A

REFERENCES

DA Pam 310-1	Consolidated Index of Army Publications and Blank Forms.
SB 11-573	Painting and Preservation Supplies Available for Field Use for Electronics Command Equipment.
TM 746-10	Field Instructions for Painting and Preserving Electronics Command Equipment.
TM 740-90-1	Administrative Storage of Equipment.
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 11-5835-243-34 EE641-AA-MMI-010/E154 MTT TO 31S3-4-110-1	Direct Support and General Support Maintenance Manual for Magnetic Tape Transport, AN/UYH-5 (NSN 7025-01-125-5767).
TM 11-6625-3024-24P EE641-AC-PLL-010/E154 SYSEX TO 33AA50-5-4	Repair Parts and Special Tools List (RPSTL): Test Set, Transport, Magnetic Tape TS-4002/UYH-5 (NSN 6625-01-128-2432).
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).
TM 11-6625-654-14	Operator's, Organizational, Direct Support, and General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools List) for Multimeter AN/USM-223, (NSN).
TM 11-6625-2735-14 0969-LP-170-1090 TO 33A1-13-498-1	Operator's, Organizational, Direct Support, and General Support Maintenance Manual (Including Depot Maintenance) for Oscilloscope OS-261/U (NSN 6625-00-127-0079).

APPENDIX B

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

B-1. General. This appendix provides a summary of the maintenance operations for the Test Set, Transport, Magnetic Tape TS-4002/UYH-5. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function.

B-2. Maintenance Concept. Three levels of maintenance shall be utilized for the equipment as follows:

Organizational Level
General Support Level
Depot Level.

a. Organization Maintenance. That maintenance which is the responsibility of and performed by a using organization on its assigned equipment. Its phases normally consist of inspecting, servicing, lubricating, and adjusting, and the replacement of parts, minor assemblies and subassemblies. This level is designated by an O in the Maintenance Category columns in Section II.

b. General Support Maintenance. That maintenance which is the responsibility of and performed by designated maintenance activities to support lower level activities. General Support Maintenance is normally accomplished in fixed shops. This level is designated by an H in the Maintenance Category columns in Section II.

c. Depot Maintenance. That maintenance which is the responsibility of and performed by designated maintenance activities, to augment stocks of serviceable material, and to support lower level activities by the use of more extensive shop facilities, equipment and personnel of higher technical skills than are available at the lower level of maintenance. Its phases normally consist of inspection, test, repair, modification, alteration, modernization, conversion, overhaul reclamation, or rebuild of parts, assemblies, subassemblies, components, equipment end items, and weapon systems; and the manufacture of critical non-available parts. Depot Maintenance is normally accomplished in fixed shops. This level is designated by a D in the Maintenance Category columns in Section II.

B-3. Maintenance Function. Maintenance functions for the Test Set, Transport, Magnetic Tape TS-4002/UYH-5 are defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of the equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance service (inspect, test, service, adjust, align, calibrate, or replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the

Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/components.

B-4. Column Entries.

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Function. Column 3 lists the functions to be performed on the item listed in Column 2. When items are listed without maintenance functions, it is solely for the purpose of having the group numbers in the MAC and RPSTL coincide.

d. Column 4, Maintenance Category. Column 4 specifies by the listing of a worktime figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate worktime figures will be shown for each category. The number of task-hours specified by the worktime figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of Column 4 are as follows:

C	Operator/Crew
O	Organizational
F	Direct Support
H	General Support
D	Depot.

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools), and special tools, test, and support equipment required to perform the designated function.

f. Column 6, Remarks. Column 6 contains an alphabetic code which leads to the remark in Section IV, Remarks, which is pertinent to the item opposite the particular code.

B-5. Tool and Test Equipment Requirements (Section III).

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. Maintenance Category. The codes in this column indicate the maintenance category allocated the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column lists the National/NATO stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5-digit) in parentheses.

B-6. Remarks (Section IV).

a. Reference Code. This code refers to the appropriate item in Section II, Column 6.

b. Remarks. This column provides the required explanatory information necessary to clarify items appearing in Section II.

SECTION II. MAINTENANCE ALLOCATION CHART FOR TEST SET, TRANSPORT, MAGNETIC TAPE TS-4002/UYH-5

(1) Group Number	(2) Component Assembly	(3) Maintenance Functions	(4) Maintenance Category					(5) Tools and Equip.	(6) Remarks
			C	O	F	H	D		
00	TEST SET, MAGNETIC TAPE TRANSPORT	INSPECT		0.1					A
		TEST		0.1					B
		REPLACE		0.1					
		REPAIR		0.1				1,2	C
		OVERHAUL					60.0	1,2,3, 4,5,6	
		REBUILD					80.0	1,2,3, 4,5,6	
01	ELECTRONIC HOUSING ASSEMBLY	REPLACE		0.1				2	
		REPAIR		0.7				1,2	C
		REPAIR				1.5		1,2,3, 4,5,6	
0101	PRINTED CIRCUIT CARDS A2A1,A2A2,A2A3,A2A4, A2A5,A2A6	REPLACE		0.1				2	
		REPAIR		0.1				1,2	C
		REPAIR					1.5	1,2,3, 5,6	
0102	POWER/STOP SWITCH ASSEMBLY	REPAIR		0.7				1,2,4	C,D
0103	BLOWER	REPAIR		0.3				2	E
0104	CONNECTOR PANEL ASSEMBLY	REPAIR				1.5		1,2,4	
02	POWER SUPPLY ASSEMBLY	REPLACE		0.2				2	
		REPAIR		0.1				2	C
		REPAIR					1.5	1,2,3, 4,5,6	
03	CABLES	REPLACE		0.1					
		REPAIR		1.5				1,2,4	

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS FOR TEST SET, TRANSPORT, MAGNETIC TAPE TS-4002/UYH-5

Tool or Test Equipment Ref Code	Maintenance Category	Nomenclature	National/NATO Stock Number	Tool Number
1	O,H,D	MULTIMETER AN/USM-223	6625-00-999-7465	
2	O,H,D	TOOL KIT TK-105/G	5180-00-610-8177	
3	H,D	TOOL KIT, PRINTED CIRCUIT CARD REPAIR	3439-00-196-0703	
4	O,H,D	TOOL KIT, WIRE WRAP/ ELECTRICAL CONNECTOR		
5	H,D	TEST EQUIPMENT FOR MANUAL PC CARD REPAIR (TO BE DETERMINED)		
6	H,D	OSCILLOSCOPE OS-261/U	6625-00-127-0079	

SECTION IV. REMARKS FOR TEST SET, TRANSPORT, MAGNETIC TAPE TS-4002/UYH-5

Reference Code	Remarks
A	VISUAL EXTERNAL
B	PERFORM LAMP AND PROCESSOR RESET TESTS BEFORE USE
C	ORGANIZATIONAL REPAIR INCLUDES LAMP, FUSE, OR SWITCH REPLACEMENT
D	ORGANIZATIONAL REPAIR INCLUDES ASSEMBLY REPAIR BY REPLACEMENT AFTER CATASTROPHIC FAILURE
E	REPAIR BY REPLACEMENT

APPENDIX C

COMPONENTS OF END ITEM LIST

Section I. INTRODUCTION

C-1. Scope. This appendix lists integral components of and basic issue items for the TS-4002/UYH-5 to help you inventory items required for safe and efficient operation.

C-2. General. This Components of End Item List is divided into the following sections:

a. Section II. Integral Components of the End Item. These items, when assembled, comprise the TS-4002/UYH-5 and must accompany it whenever it is transferred or turned in. The illustrations will help you identify these items.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the TS-4002/UYH-5 in operation, to operate it, and to perform emergency repair. Although shipped separately packed they must accompany the TS-4002/UYH-5 during operation and whenever it is transferred between accountable officers. The illustrations will assist you with hard-to-identify items. This manual is your authority to requisition replacement BII, based on TOE/MTOE authorization of the end item.

C-3. Explanation of Columns.

a. Illustration. This column is divided as follows:

(1) Figure Number. Indicates figure number of the illustration on which the item is shown.

(2) Item Number. The number used to identify item called out in the illustration.

b. National Stock Number. Indicates the National stock number assigned to the item and which will be used for requisitioning.

c. Part Number. Indicates the primary number used by the manufacturer, which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

d. Description. Indicates the Federal item name and, if required, a minimum description to identify the item.

e. Location. The physical location of each item listed is given in this column. The lists are designed to inventory all items in one area of the major item before moving on to an adjacent area.

f. Quantity Required (Qty Reqd). This column lists the quantity of each item required for a complete major item.

g. Quantity. This column is left blank for use during an inventory. Under the Rcv'd column, list the quantity you actually receive on your major item. The Date columns are for your use when you inventory the major item at a later date; such as for shipment to another site.

SECTION II. INTEGRAL COMPONENTS OF END ITEM

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8) QUANTITY			
(a) FIGURE NO	(b) ITEM NO	NATIONAL STOCK NUMBER	PART NO	DESCRIPTION	LOCATION	USABLE ON CODE	QTY REQD	RCV'D	DATE	DATE	DATE
C-1	1			Magnetic Tape Transport Exerciser TS-4002/UYH-5 (80058)			1				
C-1	2			Transport Signal/Control Cable 1000-564 (16845)			1				
C-1	3			Transport Power Cable 1000-566 (16845)			1				
C-1	4			Exerciser Power Cable 1000-552 (16845)			1				

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Section III.

BASIC ISSUE ITEMS

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8) QUANTITY			
(a) FIGURE NO.	(b) ITEM NO.	NATIONAL STOCK NUMBER	PART NO.	DESCRIPTION	LOCATION	USABLE ON CODE	QTY REQD	RCV'D	DATE	DATE	DATE
				NO BASIC ISSUE ITEMS							

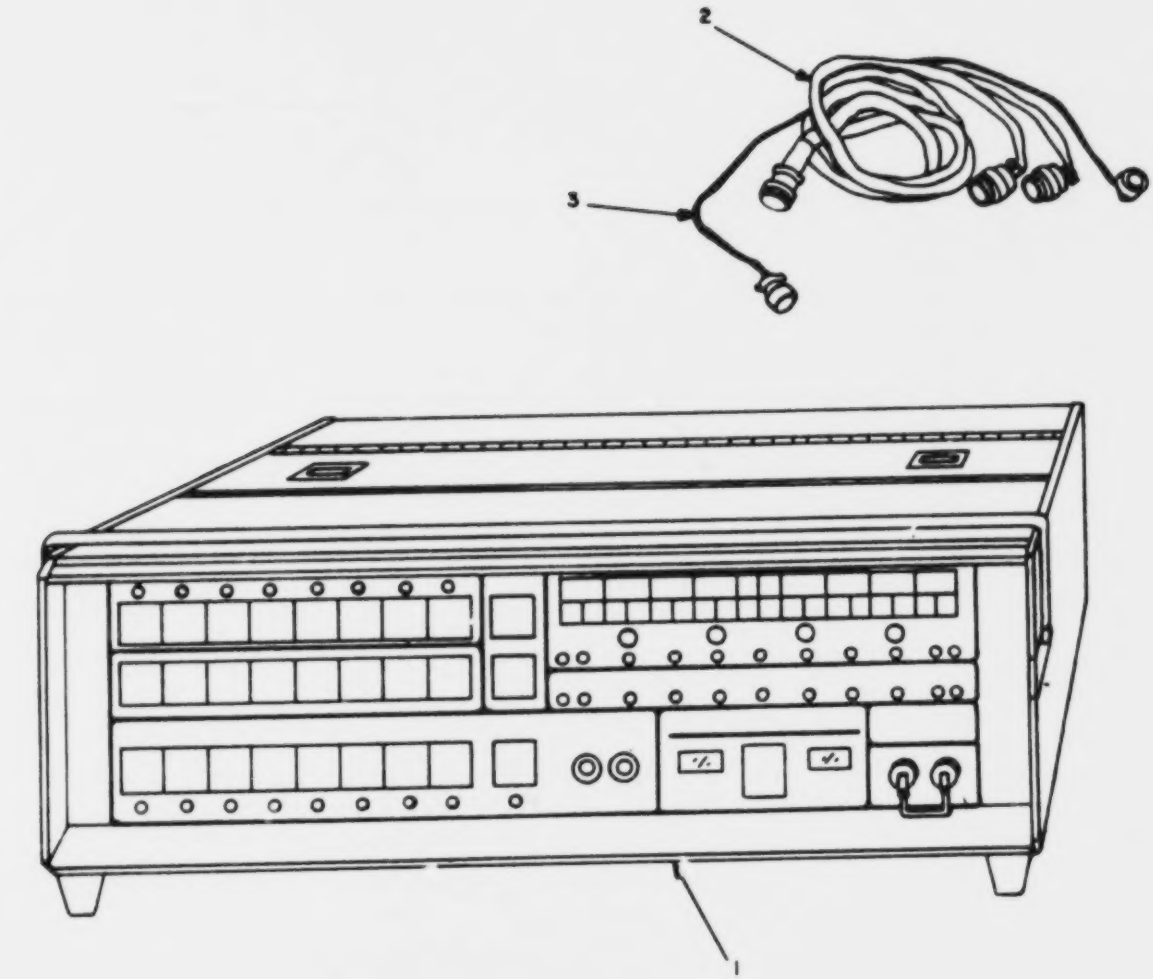

Figure C-1. Magnetic Tape Transport Exerciser, TS-4002/UYH-5.

APPENDIX D

ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

D-1. Scope. This appendix lists additional items you are authorized for the support of the TS-4002/UYH-5.

D-2. General. This list identifies items that do not have to accompany the TS-4002/UYH-5 and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

D-3. Explanation of Listing. National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment.

Section II.
ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION PART NUMBER & FSCM USABLE ON CODE	(3) U/M	(4) QTY AUTH
	NO ADDITIONAL AUTHORIZED ITEMS		

APPENDIX E

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

E-1. Scope. This appendix lists expendable supplies and materials you will need to operate and maintain the TS-4002/UYH-5. These items are authorized to you by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

E-2. Explanation of Columns.

a. Column 1 – Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 5, App. D").

b. Column 2 – Level. This column identifies the lowest level of maintenance that requires the listed item.

C – Operator/Crew
O – Organizational Maintenance
F – Direct Support Maintenance
H – General Support Maintenance

c. Column 3 – National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column 4 – Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Federal Supply Code for Manufacturer (FSCM) in parentheses, if applicable.

e. Column 5 – Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	0	8305-267-3015	Cloth, cotton, cheesecloth	ROLL
2	0		Enamel,	QT
3	0	8010-582-5318	Primer, zinc chromate	QT
4	0		Sandpaper, Fine, No. 0000	SHT
5	0		Soft-bristle brush	EA
6	0	6810-00-292-9625	Trichlorotrifluoroethane OT620 (81349)	OZ

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Stateside, N.J. 07703

DATE SENT
4 April 1978

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5840-340-14&P	23 Jan 74	Radar Set AN/PRC-76

BE EXACT PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	
2-25	2-28			Recommend that the installation antenna alignment procedure be changed throughout to specify a 2^{o} IFF antenna lag rather than 1^{o}. REASON: Experience has shown that with only a 1^{o} lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2^{o} without degradation of operation.
3-10	3-3		3-1	Item 5, Function column. Change "2 db" to "3db." REASON: The adjustment procedure the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.
5-6	5-8			Add new step f.1 to read, "Replace cover plate removed in step e.1, above." REASON: To replace the cover plate.
E-5				For item 2, change the NSN to read: 5835-00-134-9186. REASON: Accuracy.
E-8		E-3		Identify the cover on the junction box (item no. 5). REASON: It is a separate item and is not called out on figure 19.
E-9				Add the cover of the junction box as an item in the listing for figure 19. REASON: Same as above.

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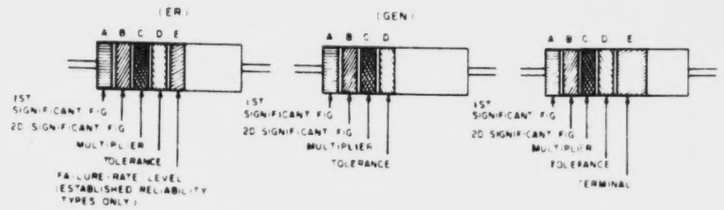


COLOR CODE MARKING FOR COMPOSITION TYPE RESISTORS

COLOR CODE MARKING FOR FILM-TYPE RESISTORS

TABLE I
COLOR CODE FOR COMPOSITION TYPE AND FILM TYPE RESISTORS

BAND A		BAND B		BAND C		BAND D		BAND E		
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)	COLOR	FAILURE RATE LEVEL	TERM
BLACK	0	BLACK	0	BLACK				BROWN	M=1.0	
BROWN	1	BROWN	1	BROWN	10			RED	P=0.1	
RED	2	RED	2	RED	100			ORANGE	R=0.01	
ORANGE	3	ORANGE	3	ORANGE	1,000			YELLOW	S=0.001	
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	±10 (COMP TYPE ONLY	WHITE		SOLDERABLE
GREEN	5	GREEN	5	GREEN	100,000	GOLD	±5			
BLUE	6	BLUE	6	BLUE	1,000,000	RED	±2 (NOT APPLICABLE TO ESTABLISHED RELIABILITY)			
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7							
GRAY	8	GRAY	8	SILVER	0.01					
WHITE	9	WHITE	9	GOLD	0.1					

BAND A — THE FIRST SIGNIFICANT FIGURE OF THE RESISTANCE VALUE. BANDS A THRU D SHALL BE OF EQUAL WIDTH.

BAND B — THE SECOND SIGNIFICANT FIGURE OF THE RESISTANCE VALUE.

BAND C — THE MULTIPLIER. THE MULTIPLIER IS THE FACTOR BY WHICH THE TWO SIGNIFICANT FIGURES ARE MULTIPLIED TO YIELD THE NOMINAL RESISTANCE VALUE.

BAND D — THE RESISTANCE TOLERANCE.

BAND E — WHEN USED ON COMPOSITION RESISTORS, BAND E INDICATES ESTABLISHED RELIABILITY FAILURE-RATE LEVEL. PERCENT FAILURE PER 1,000 HOURS. ON FILM RESISTORS THIS BAND SHALL BE APPROXIMATELY 1½ TIMES THE WIDTH OF OTHER BANDS AND INDICATES TYPE OF TERMINAL.

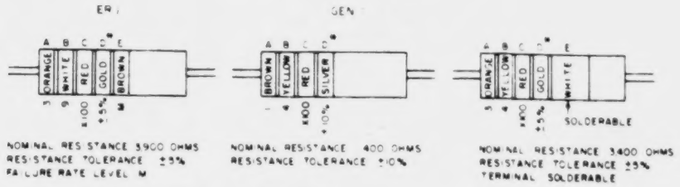
RESISTANCES IDENTIFIED BY NUMBERS AND LETTERS
(THESE ARE NOT COLOR CODED)

SOME RESISTORS ARE IDENTIFIED BY THREE OR FOUR DIGIT ALPHA NUMERIC DESIGNATORS. THE LETTER R IS USED IN PLACE OF A DECIMAL POINT WHEN FRACTIONAL VALUES OF AN OHM ARE EXPRESSED. FOR EXAMPLE:

2R7 = 2.7 OHMS 1OR0 = 10.0 OHMS

FOR WIRE-WOUND TYPE RESISTORS, COLOR CODING IS NOT USED. IDENTIFICATION MARKING IS SPECIFIED IN EACH OF THE APPLICABLE SPECIFICATIONS.

EXAMPLES OF COLOR CODING



NOMINAL RESISTANCE 3900 OHMS
RESISTANCE TOLERANCE ±5%
FAILURE RATE LEVEL M

NOMINAL RESISTANCE 400 OHMS
RESISTANCE TOLERANCE ±10%

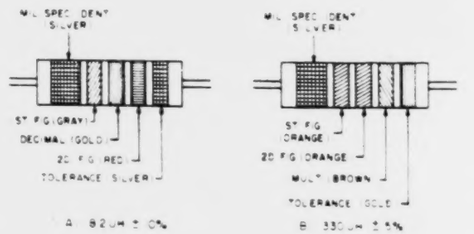
NOMINAL RESISTANCE 3400 OHMS
RESISTANCE TOLERANCE ±5%
TERMINAL SOLDERABLE

COMPOSITION-TYPE RESISTORS

FILM-TYPE RESISTORS

* IF BAND D IS OMITTED THE RESISTOR TOLERANCE IS ±20% AND THE RESISTOR IS NOT MIL-STD

A COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS



COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES. AT A AN EXAMPLE OF THE CODING FOR AN 8.2 UH CHOKE IS GIVEN. AT B THE COLOR BANDS FOR A 330 UH INDUCTOR ARE ILLUSTRATED.

TABLE 2
COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES

COLOR	SIGNIFICANT FIGURE	MULTIPLIER	INDUCTANCE TOLERANCE (PERCENT)
BLACK	0		
BROWN		0	
RED	2	00	2
ORANGE	3	000	3
YELLOW	4		
GREEN	5		
BLUE	6		
VIOLET	7		
GRAY	8		
WHITE	9		
NONE			20
SILVER			0
GOLD	DECIMAL POINT		5

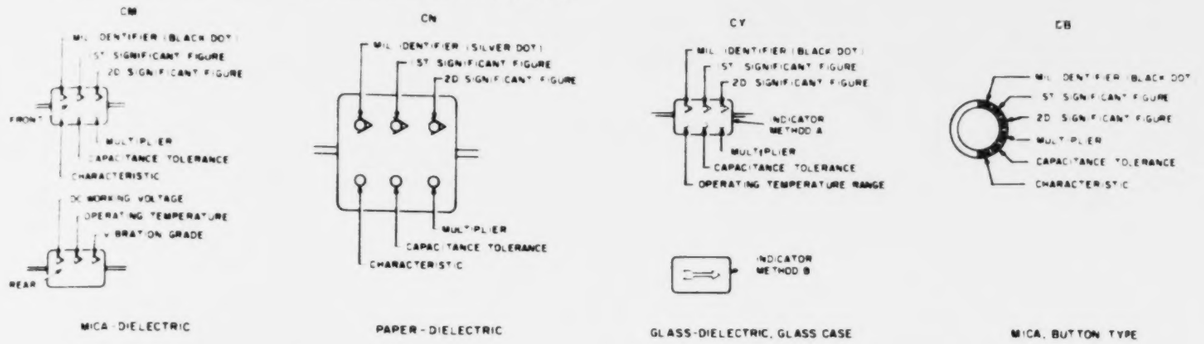
MULTIPLIER IS THE FACTOR BY WHICH THE TWO COLOR FIGURES ARE MULTIPLIED TO OBTAIN THE INDUCTANCE VALUE OF THE CHOKE COIL.

B COLOR CODE MARKING FOR MILITARY STANDARD INDUCTORS

4010-81

Figure FO-1.
Color Coding Chart (Sheet 1 of 2)

CAPACITORS, FIXED, VARIOUS-DIELECTRICS, STYLES CM, CN, CY, AND CB



MICA-DIELECTRIC | PAPER-DIELECTRIC | GLASS-DIELECTRIC, GLASS CASE | MICA, BUTTON TYPE

TABLE 3 — FOR USE WITH STYLES CM, CN CY AND CB

COLOR	MIL-C	1ST SIG FIG	2D SIG FIG	MULTIPLIER	CAPACITANCE TOLERANCE CM	CN	CY	CB	CHARACTERISTIC[2] CM	CN	CB	DC WORKING VOLTAGE CM	OPERATING TEMP RANGE CY, CM	VIBRATION GRADE CM
BLACK	CM, CY, CB	0	0	1			±20%	±20%		A			-55°TO+70°C	10-55 Hz
BROWN		1	1	10					B	E	B			
RED		2	2	100	±2%		±2%	±2%	C				-55°TO+85°C	
ORANGE		3	3	1,000		±3%			D		D	300		
YELLOW		4	4	10,000					E				-55°TO+125°C	10-2,000 Hz
GREEN		5	5		±5%				F			500		
BLUE		6	6										-55°TO+150°C	
PURPLE (VIOLET)		7	7											
GRAY		8	8											
WHITE		9	9											
GOLD				0.1			±1%	±5%						
SILVER	CN			0.01	±10%	±10%	±10%	±10%						

TABLE 4 — TEMPERATURE COMPENSATING STYLE CC

COLOR	TEMPERATURE COEFF[4]	1ST SIG FIG	2D SIG FIG	MULTIPLIER	CAPACITANCE TOLERANCE: CAPACITANCES OVER 10 UUF	CAPACITANCES 10 UUF OR LESS	MIL-C
BLACK	0	0	0	1		±2.0 UUF	CC
BROWN	-30	1	1	10	±1%		
RED	-80	2	2	100	±2%	±0.25 UUF	
ORANGE	-150	3	3	1,000			
YELLOW	-220	4	4	10,000			
GREEN	-330	5	5	100,000	±5%	±0.5 UUF	
BLUE	-470	6	6	1,000,000			
PURPLE (VIOLET)	-750	7	7	10,000,000			
GRAY		8	8	0.01*			
WHITE		9	9	0.1*	±10%		
GOLD	+100			1.0		±1.0 UUF	
SILVER				0.01			

1 THE MULTIPLIER IS THE NUMBER BY WHICH THE TWO SIGNIFICANT FIGURES ARE MULTIPLIED TO OBTAIN THE CAPACITANCE IN UUF

2 LETTERS INDICATE THE CHARACTERISTICS DESIGNATED IN APPLICABLE SPECIFICATIONS MIL-C-5, MIL-C-250, MIL-C-11272, AND MIL-C-39500 RESPECTIVELY

3 LETTERS INDICATE THE TEMPERATURE RANGE AND VOLTAGE-TEMPERATURE LIMITS DESIGNATED IN MIL-C-11015

4 TEMPERATURE COEFFICIENT IN PARTS PER MILLION PER DEGREE CENTIGRADE

* OPTIONAL CODING WHERE METALLIC PIGMENTS ARE UNDESIRABLE

C COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

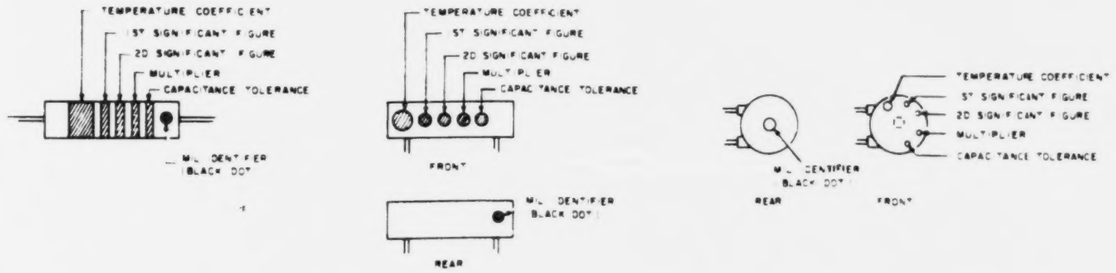


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Figure FO-1.
Color Coding Chart (Sheet 2 of 2)

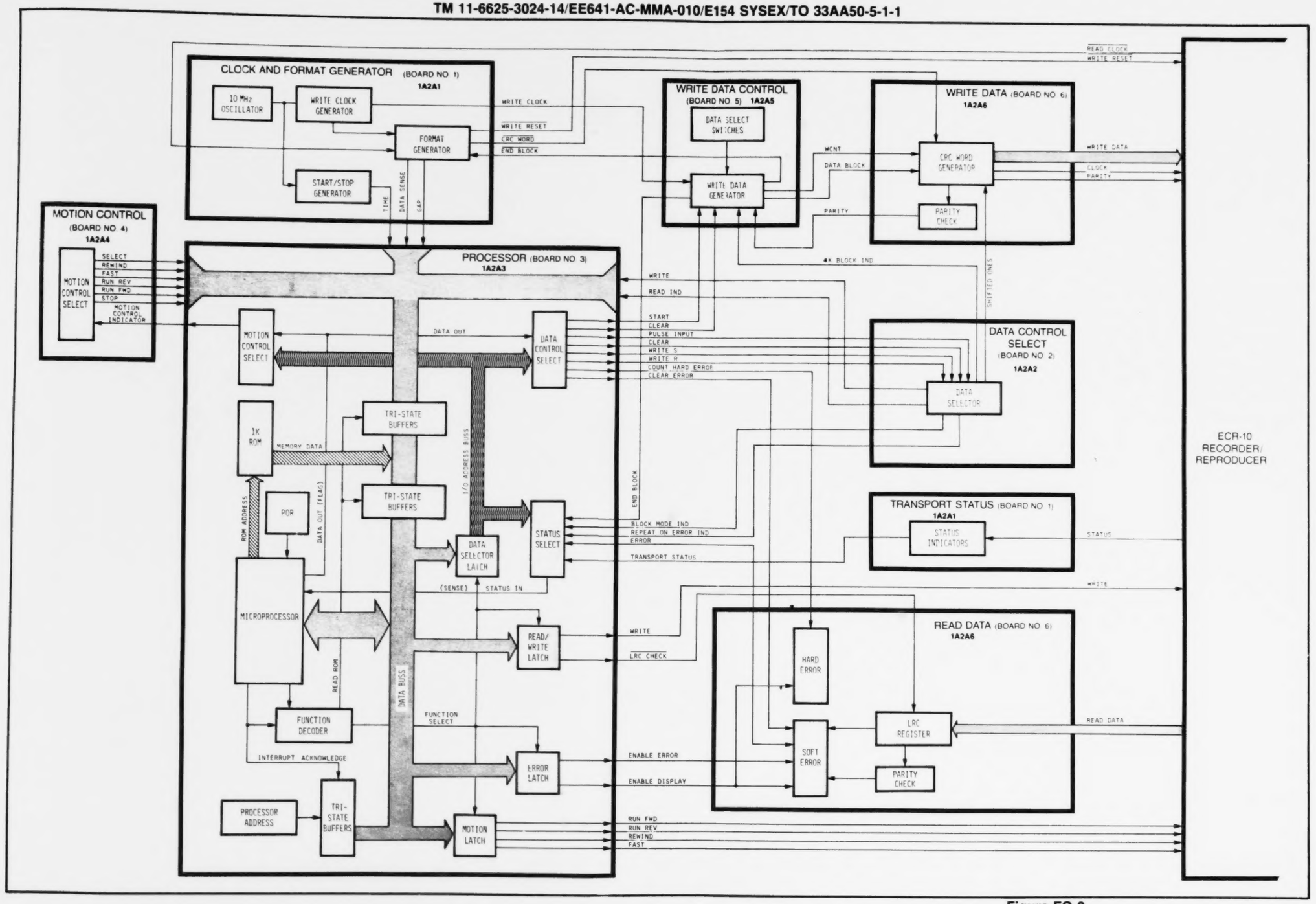


Figure FO-2.
System Block Diagram

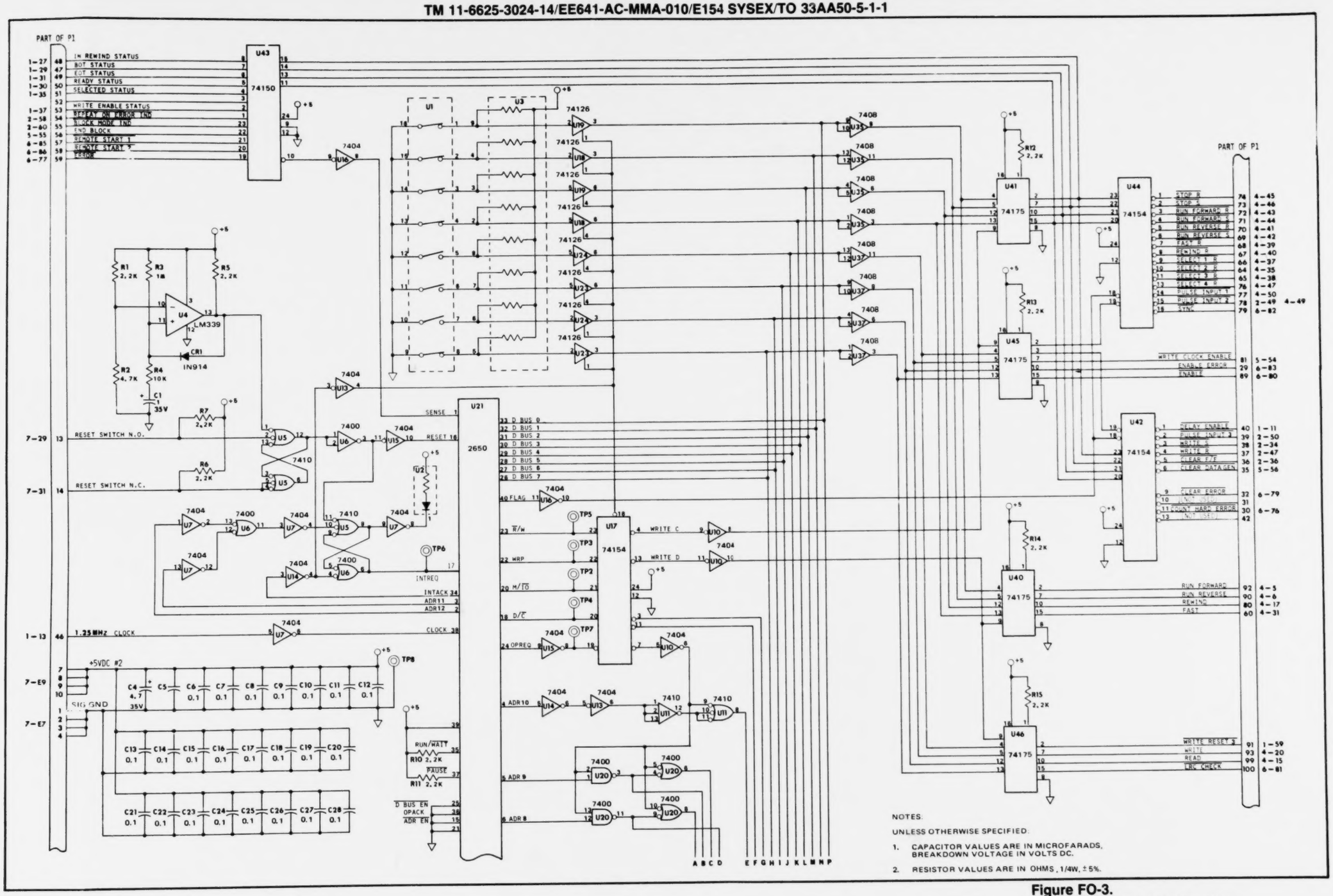


Figure FO-3.
Processor (1A2A3) Schematic
(Sheet 1 of 2)

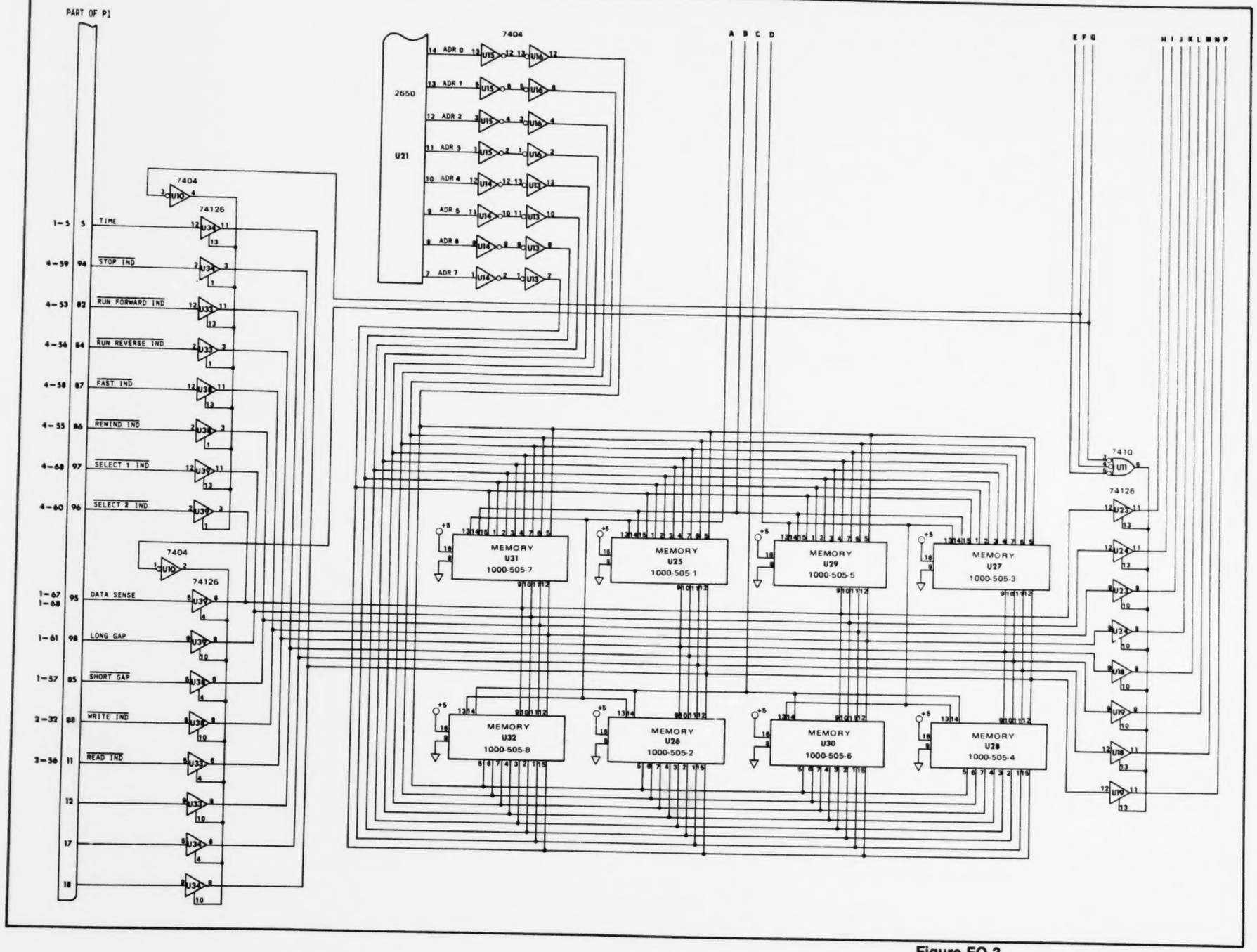
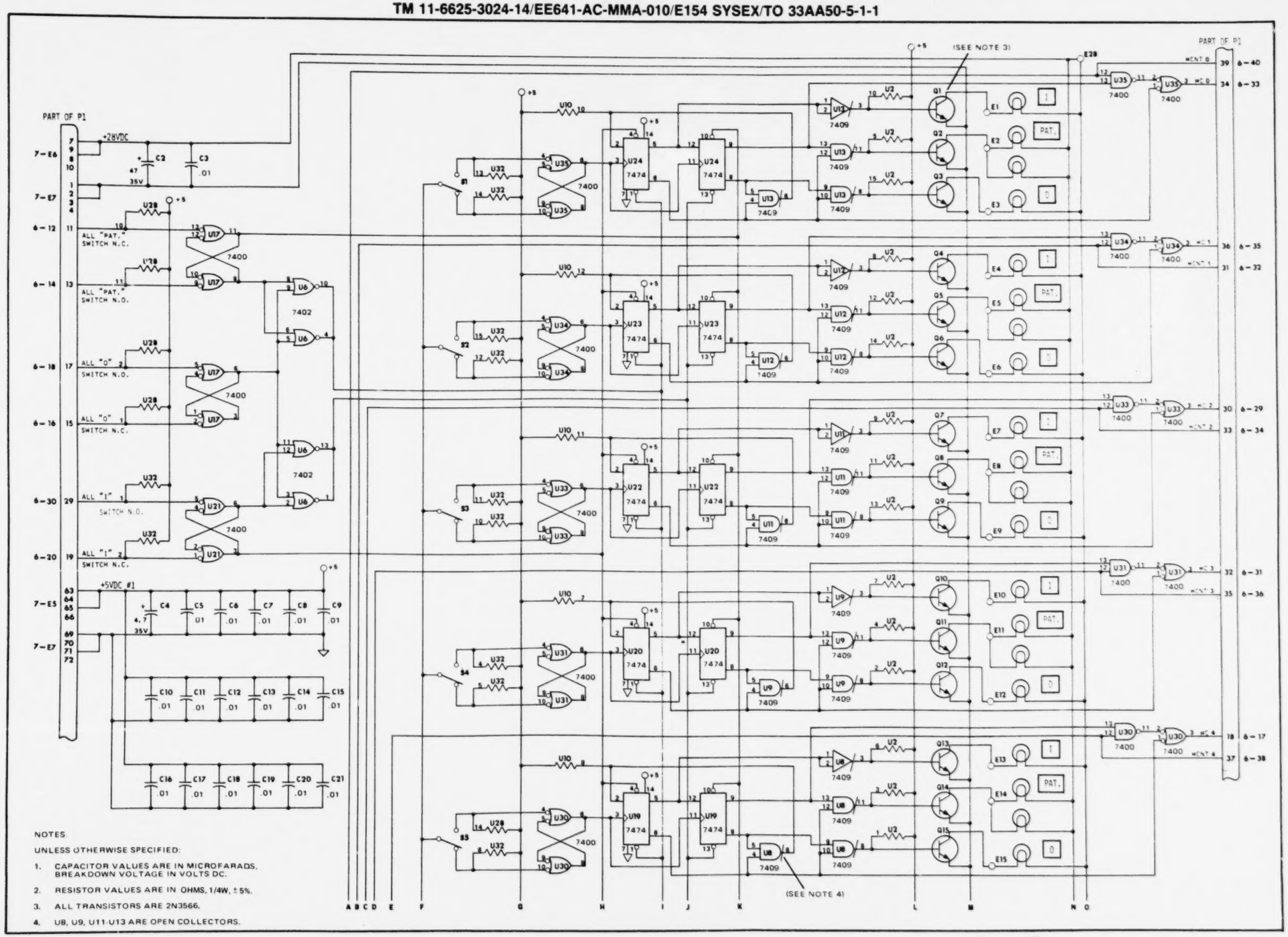


Figure FO-3.
Processor (1A2A3) Schematic
(Sheet 2 of 2)



NOTES

UNLESS OTHERWISE SPECIFIED:

1. CAPACITOR VALUES ARE IN MICROFARADS, BREAKDOWN VOLTAGE IN VOLTS DC.
2. RESISTOR VALUES ARE IN OHMS, 1/4W, ±5%.
3. ALL TRANSISTORS ARE 2N3566.
4. U8, U9, U11-U13 ARE OPEN COLLECTORS.

Figure FO-4.
Write Data Controls (1A2A5)
Schematic (Sheet 1 of 2)

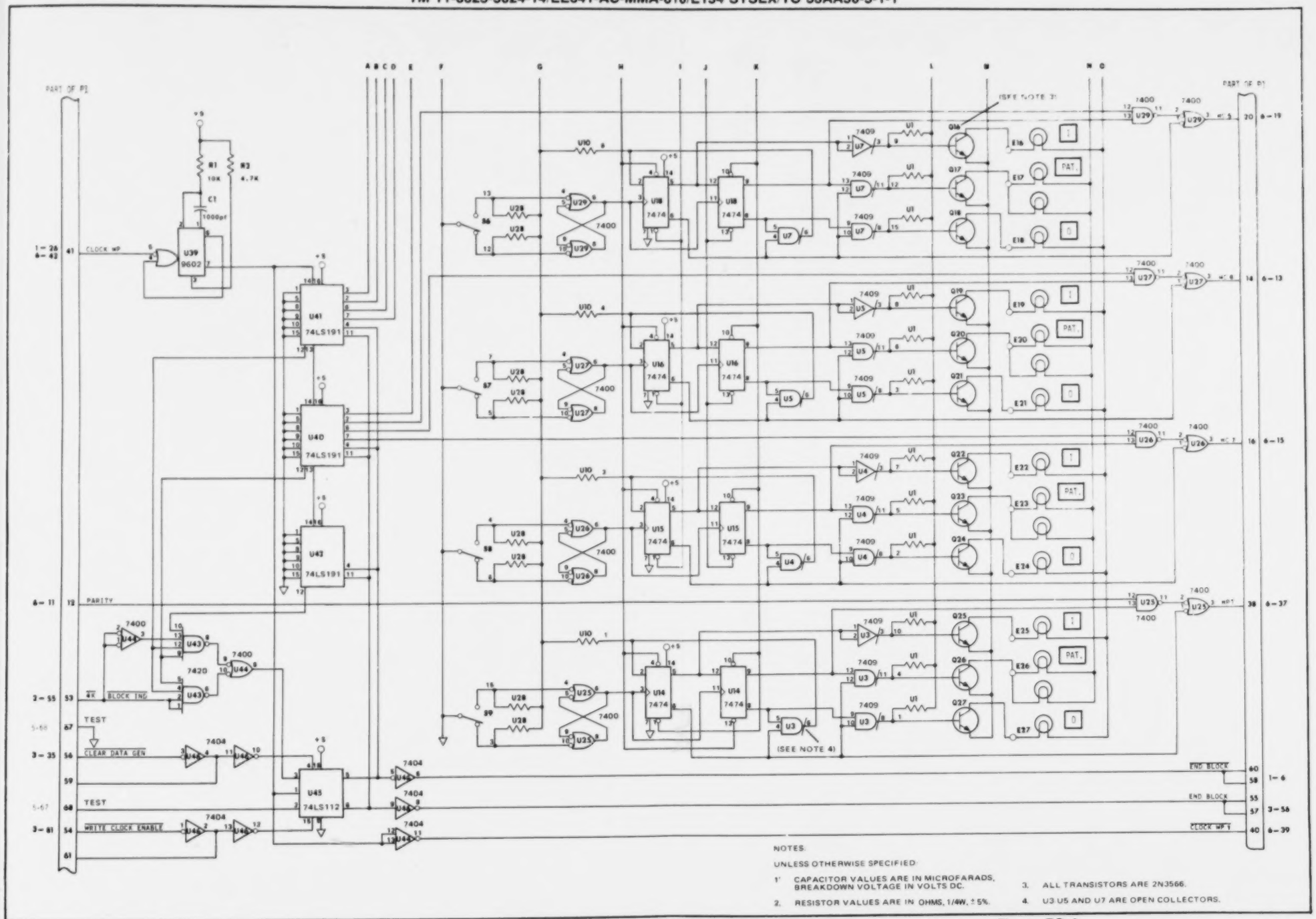


Figure FO-4.
Write Data Controls (1A2A5)
Schematic (Sheet 2 of 2)

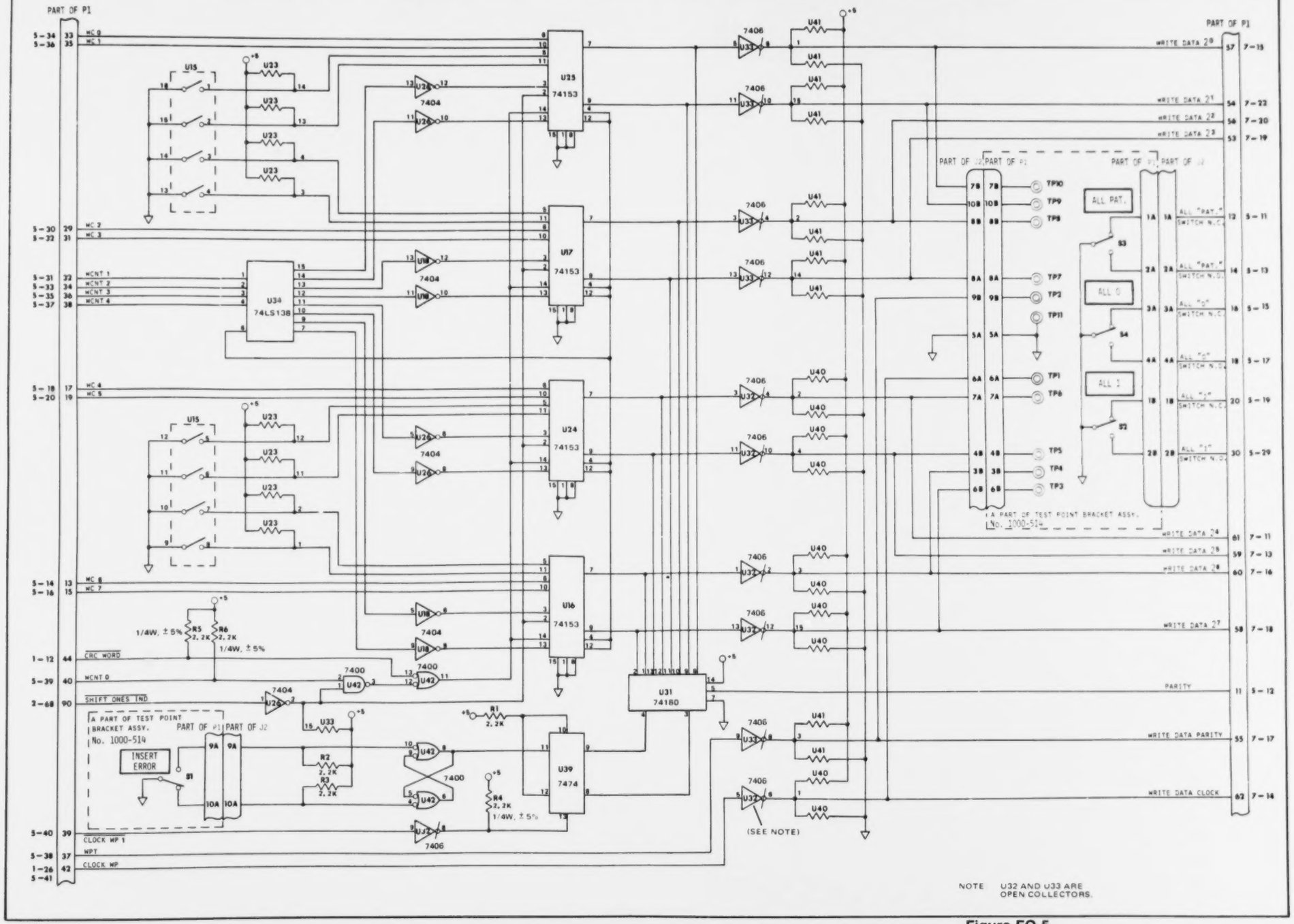


Figure FO-5.
Read Write and Error (1A2A6) Schematic (Sheet 1 of 3)

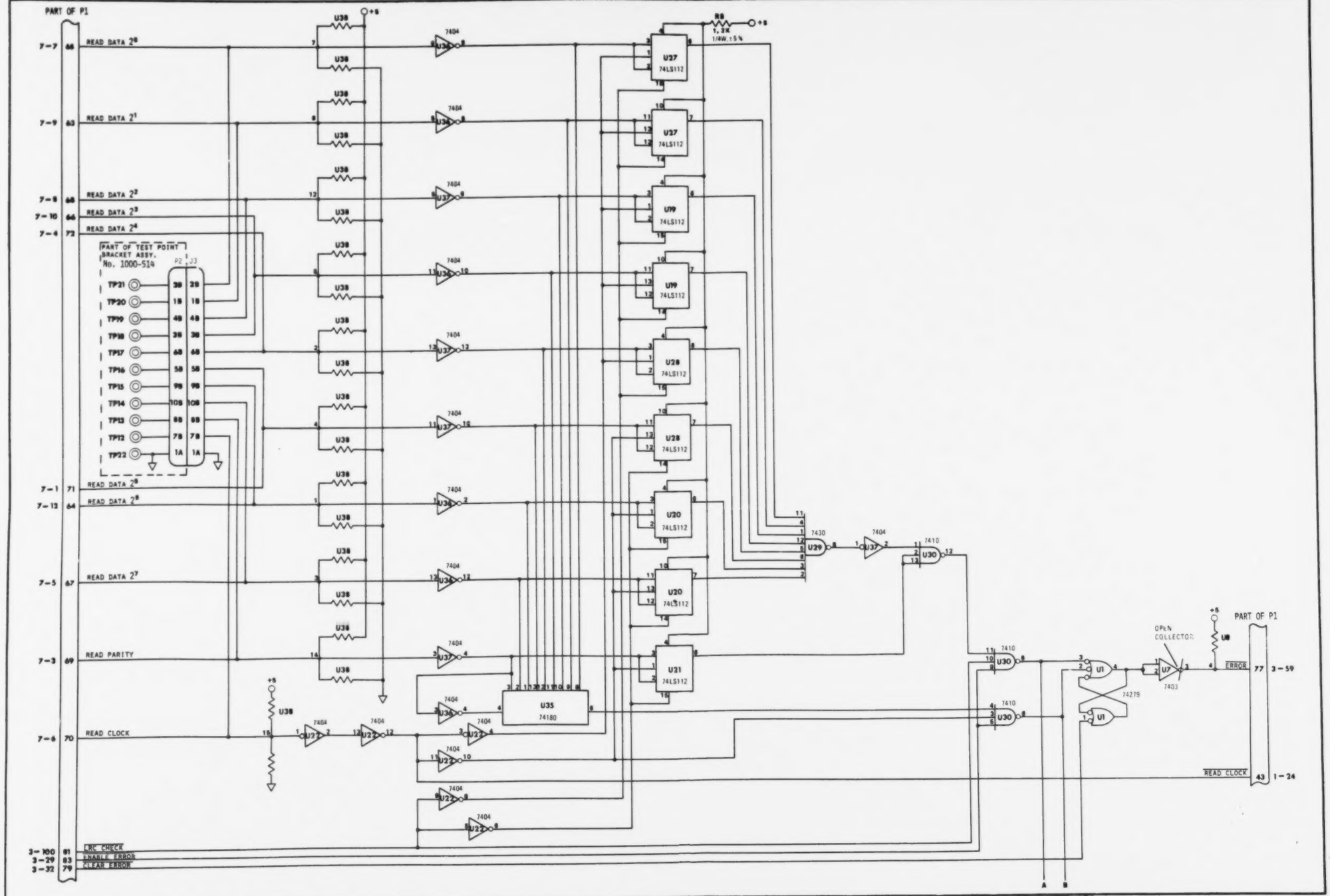


Figure FO-5.
Read Write and Error (1A2A6) Schematic (Sheet 2 of 3)

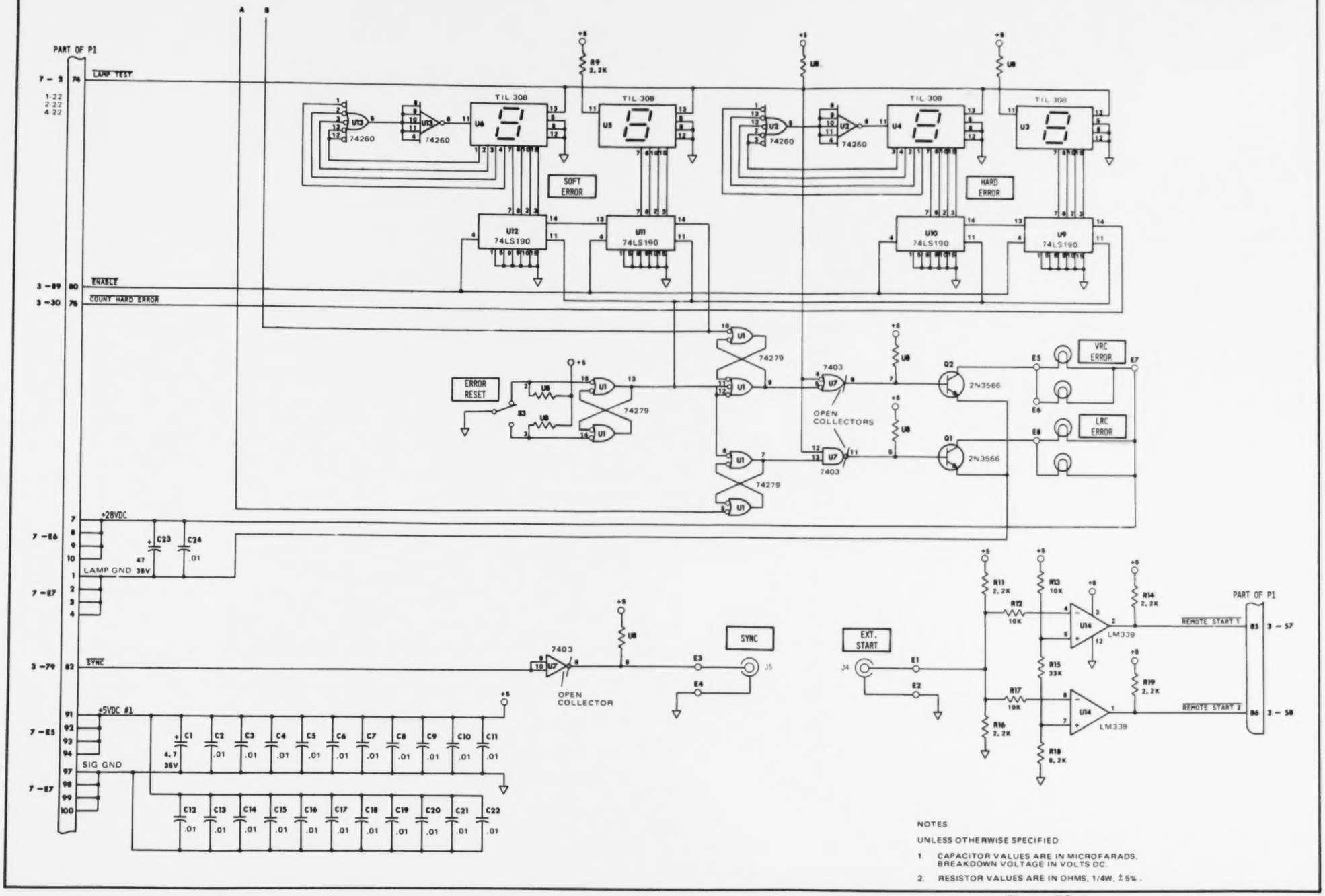


Figure FO-5.
Read Write and Error (1A2A6)
Schematic (Sheet 3 of 3)

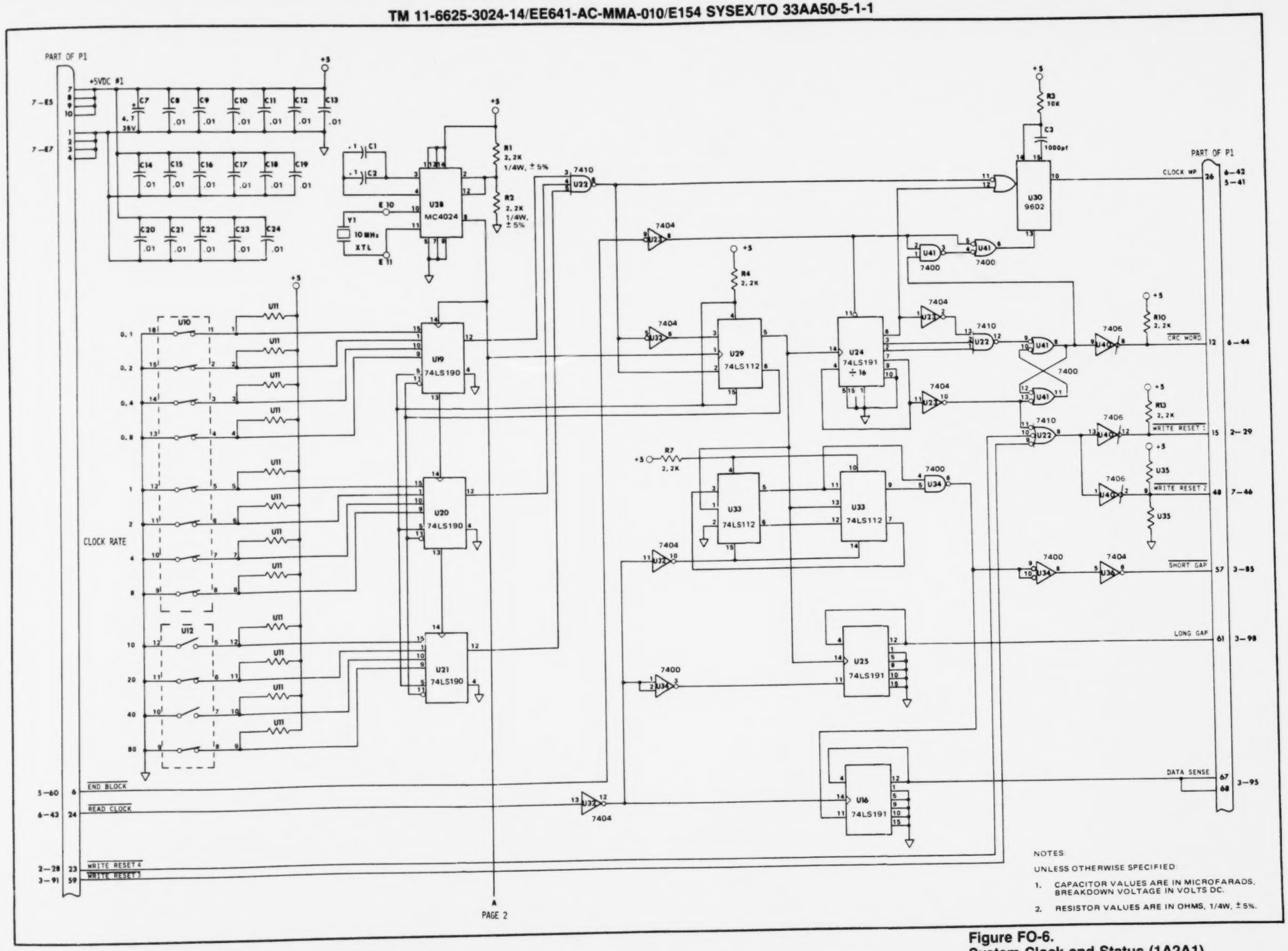


Figure FO-6.
System Clock and Status (1A2A1) Schematic (Sheet 1 of 3)

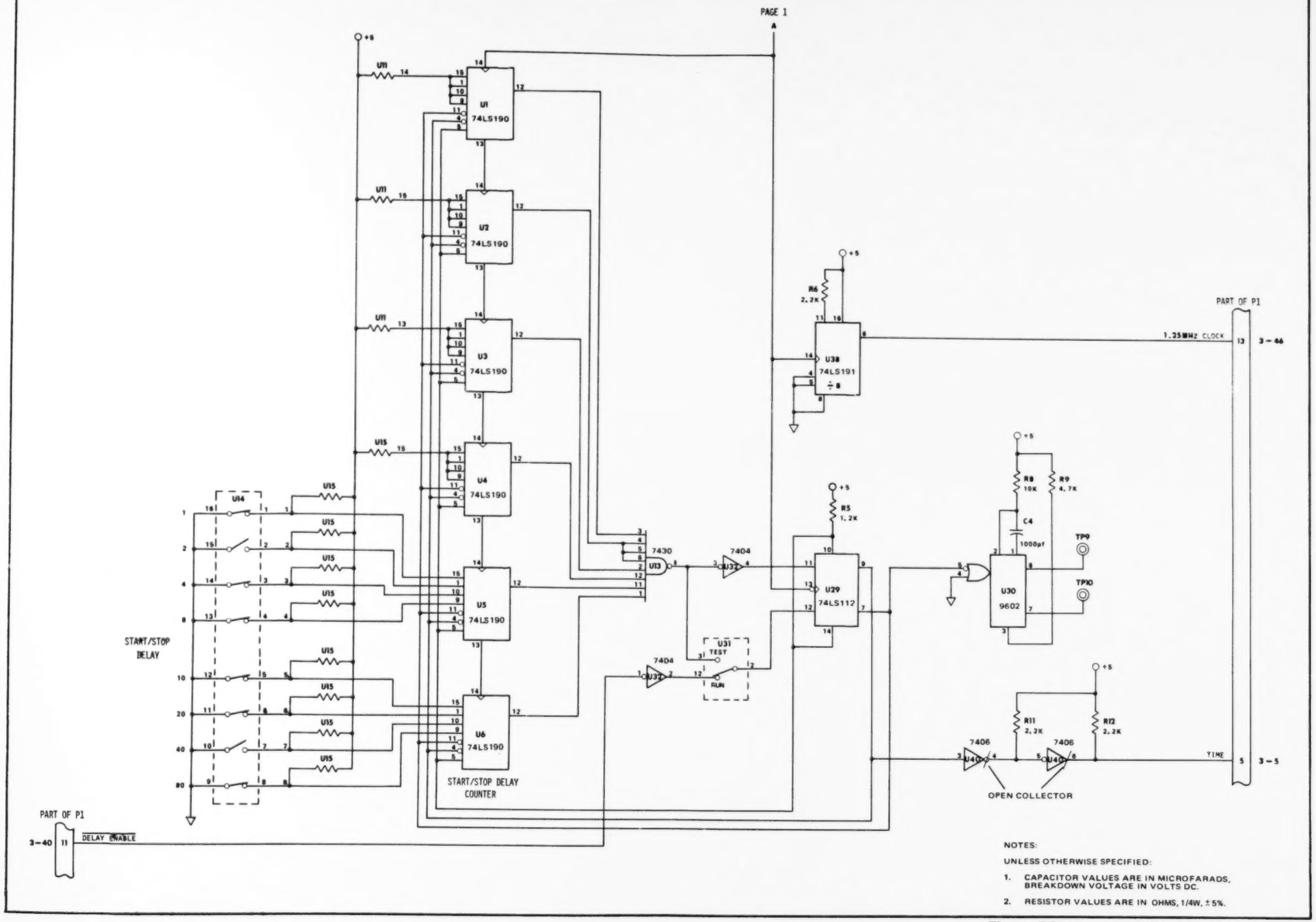


Figure FO-6.
System Clock and Status (1A2A1) Schematic (Sheet 2 of 3)

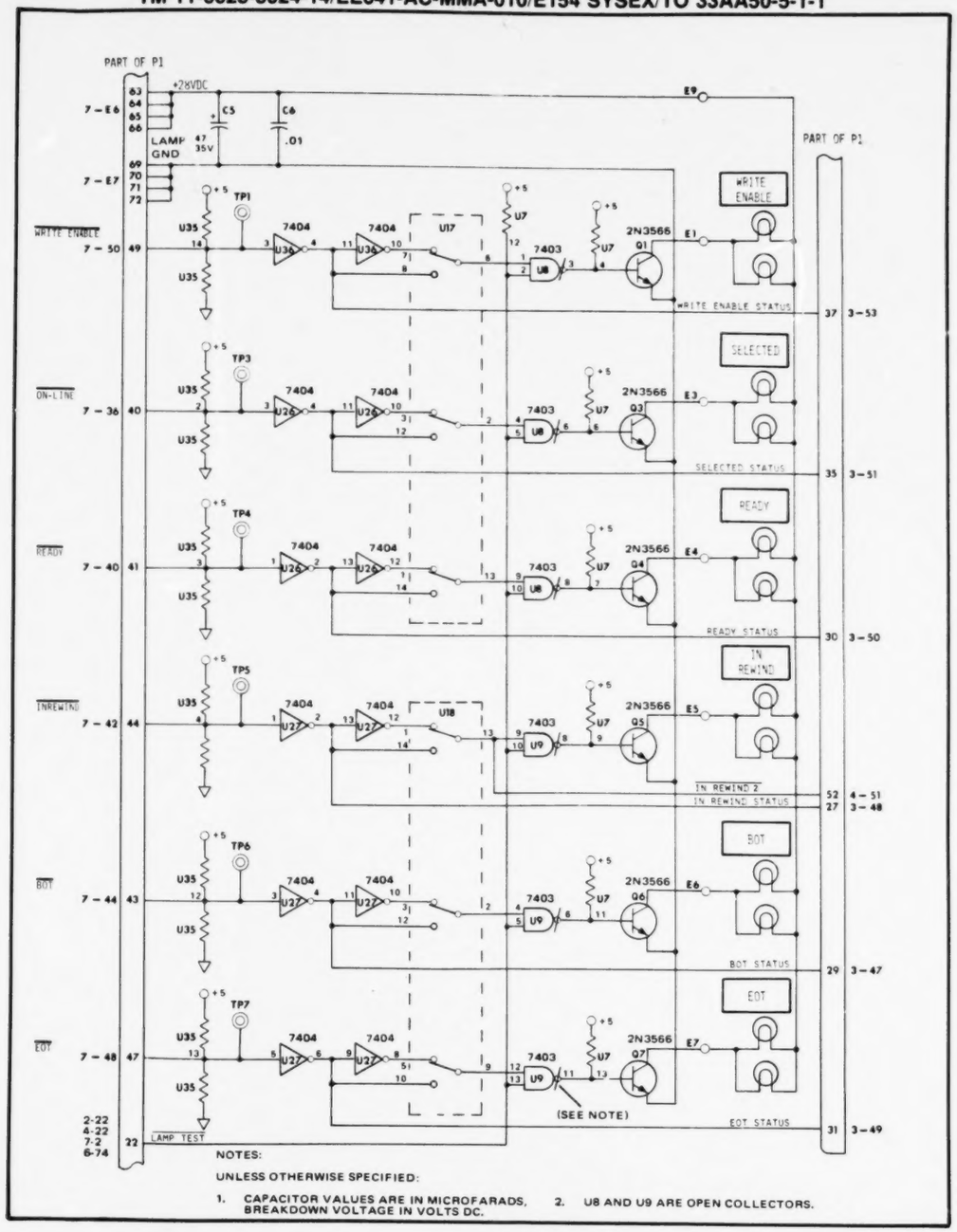


Figure FO-6.
System Clock and Status (1A2A1)
Schematic (Sheet 3 of 3)

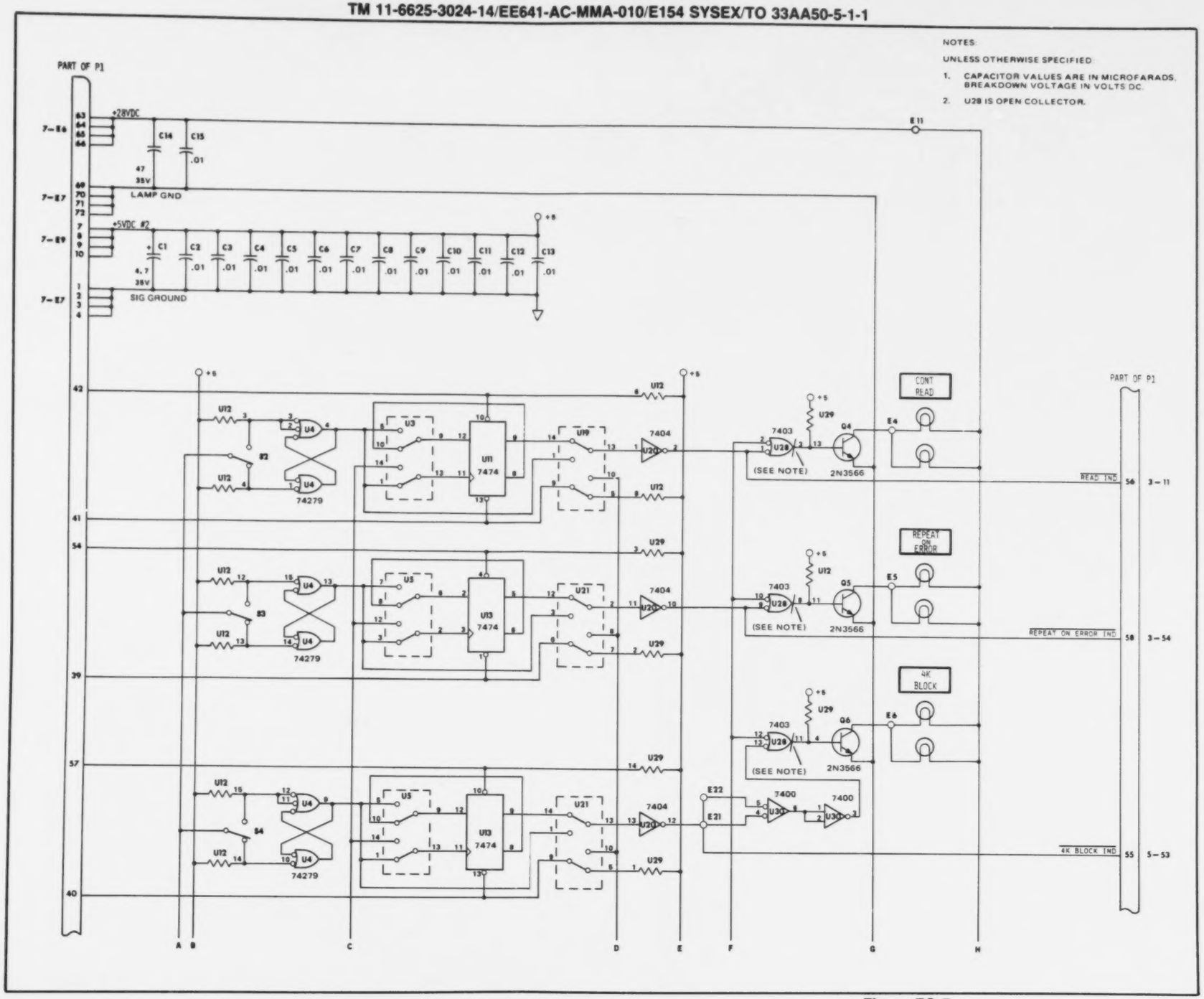


Figure FO-7.
Data Control (1A2A2) Schematic
(Sheet 1 of 2)

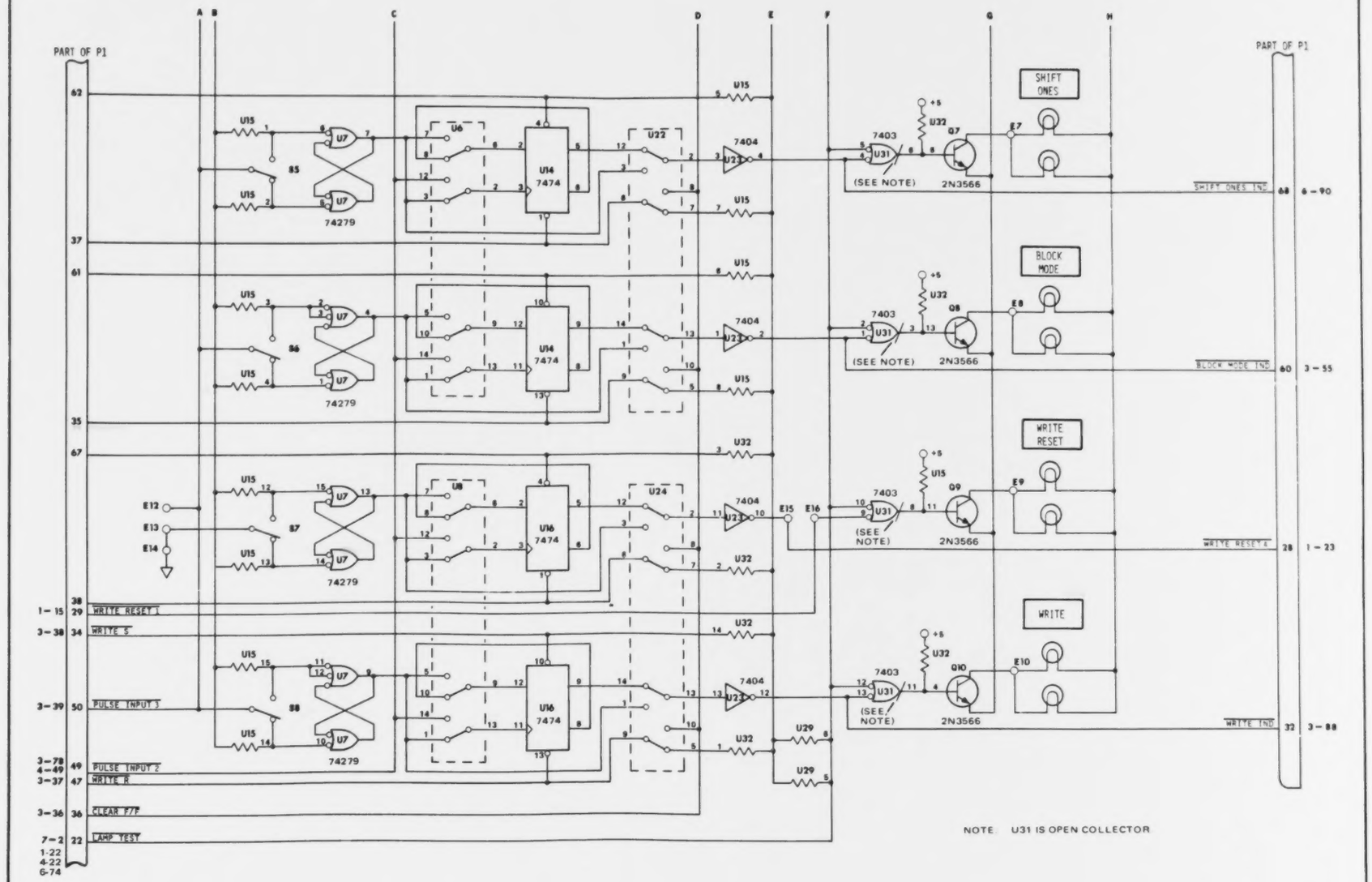


Figure FO-7.
Data Control (1A22A2) Schematic
(Sheet 2 of 2)

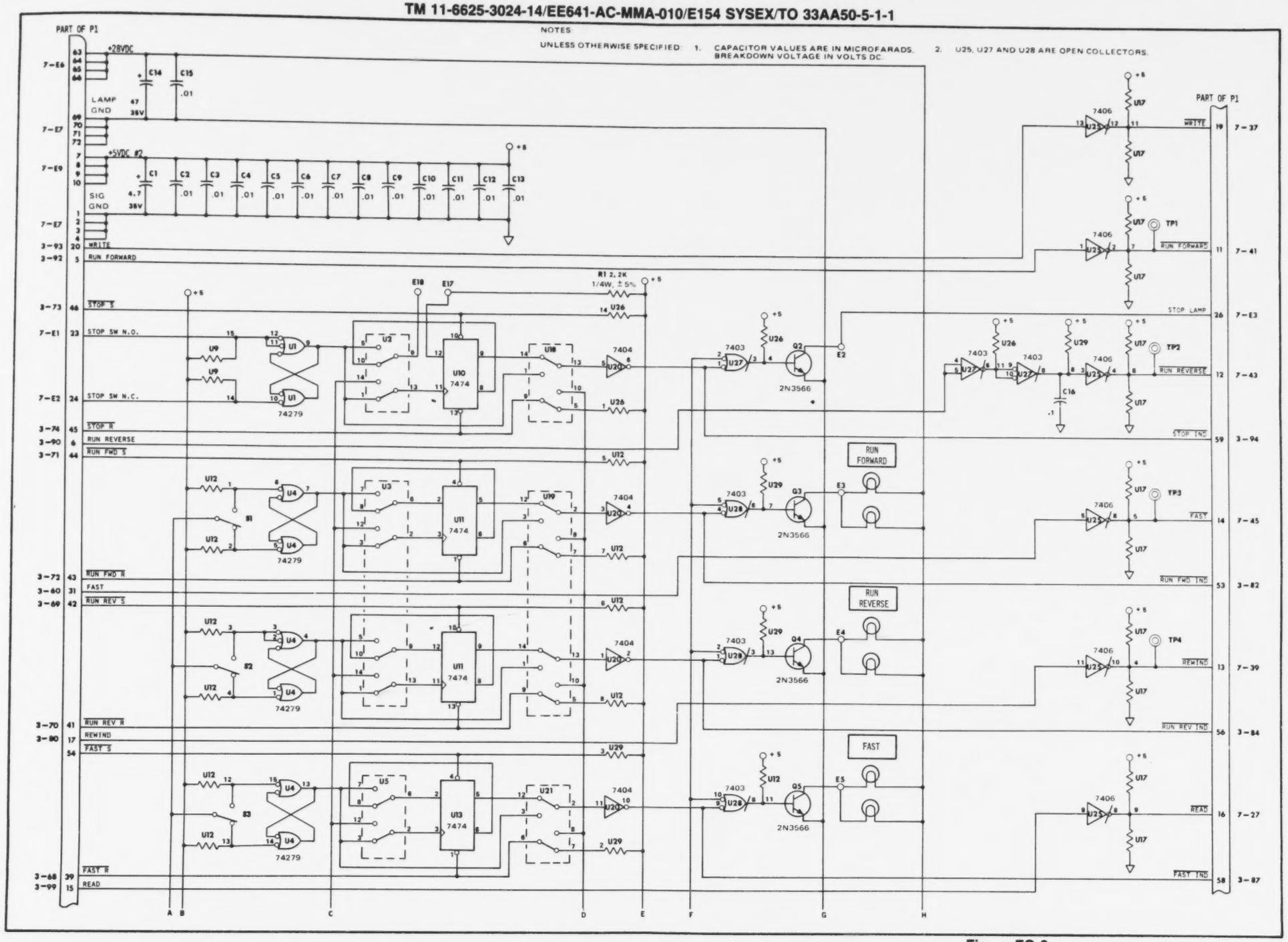


Figure FO-8.
Motion Control (1A2A4) Schematic
(Sheet 1 of 2)

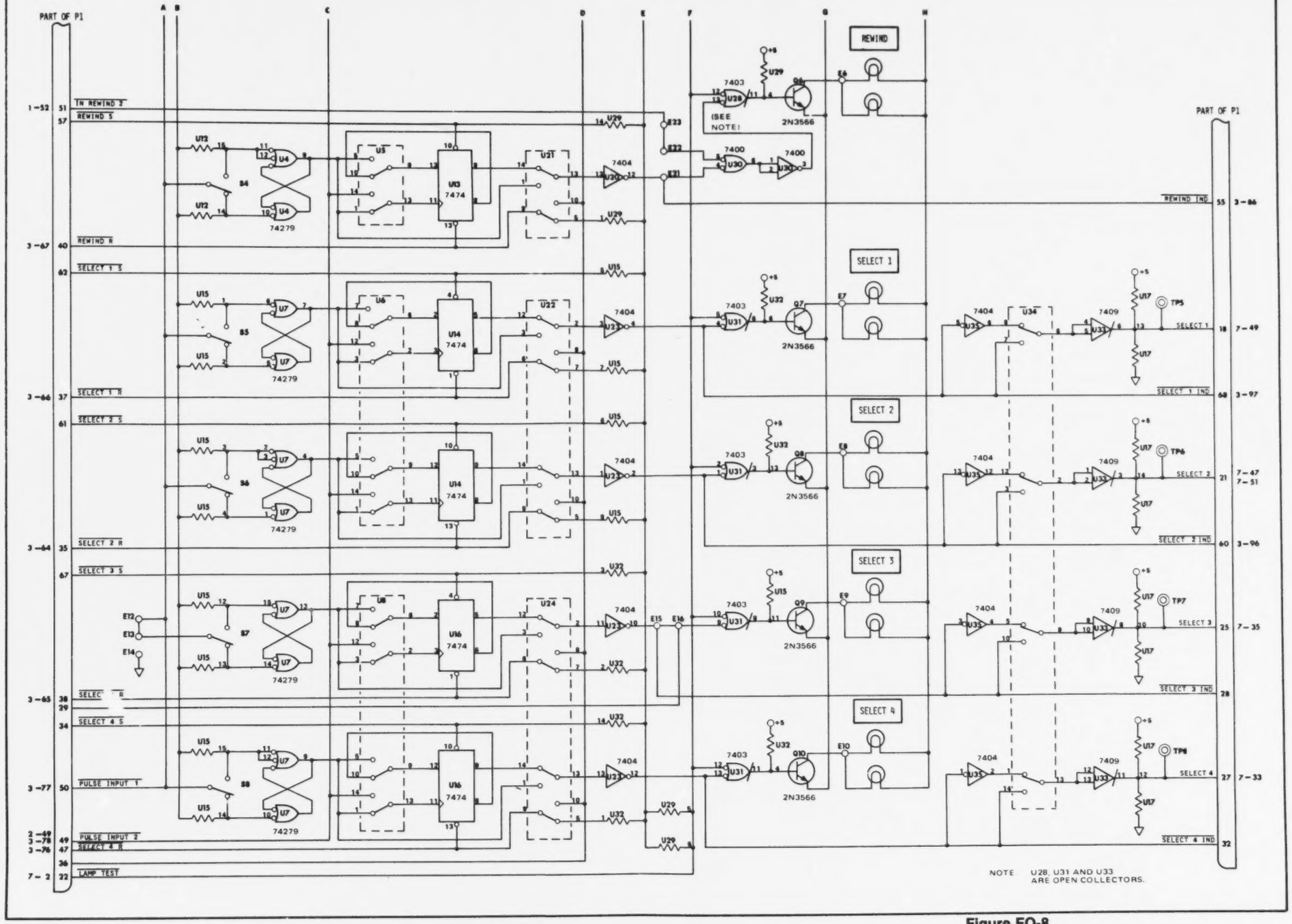


Figure FO-8.
Motion Control (1A2A4) Schematic
(Sheet 2 of 2)

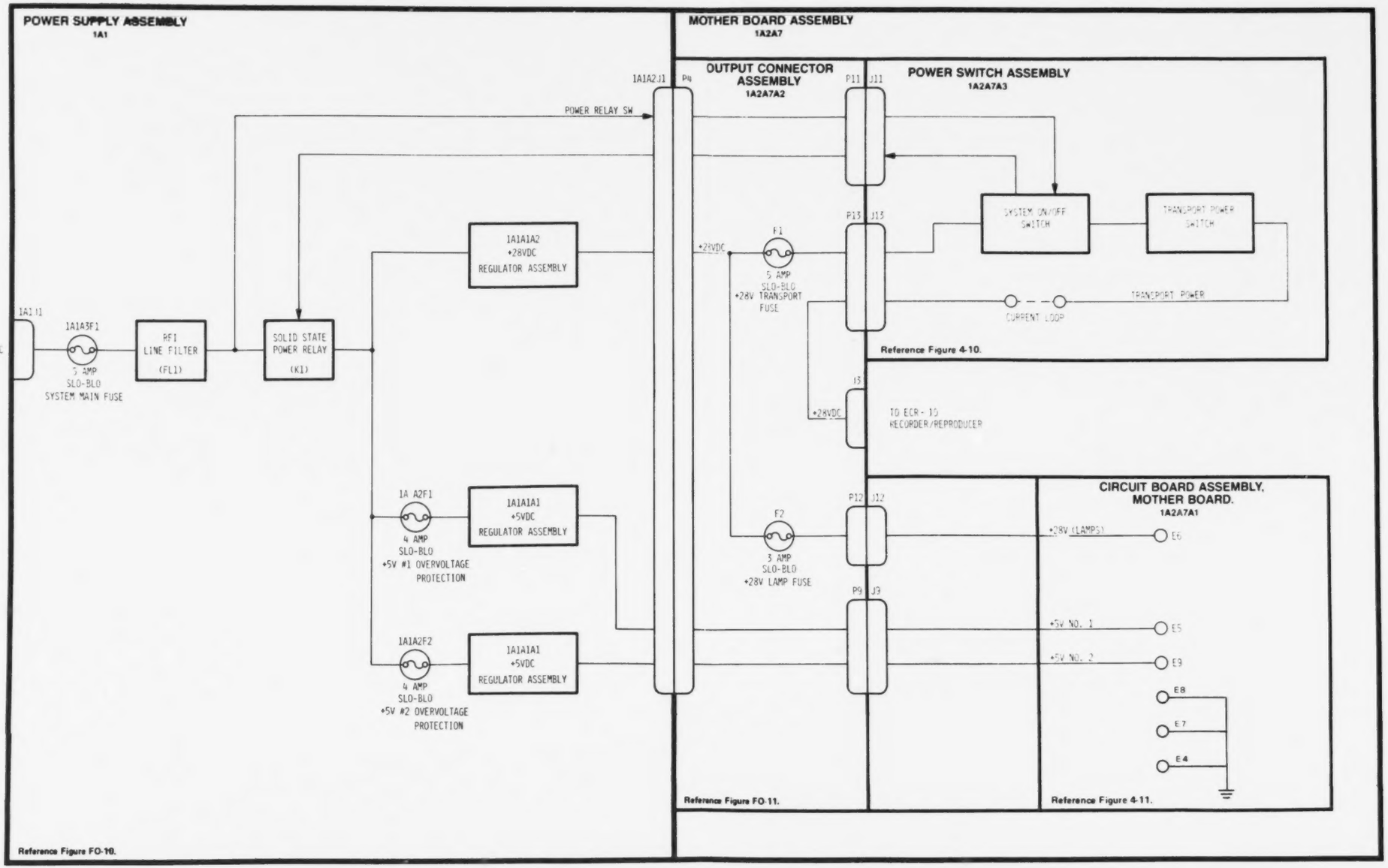


Figure FO-9.
Power Distribution Block Diagram

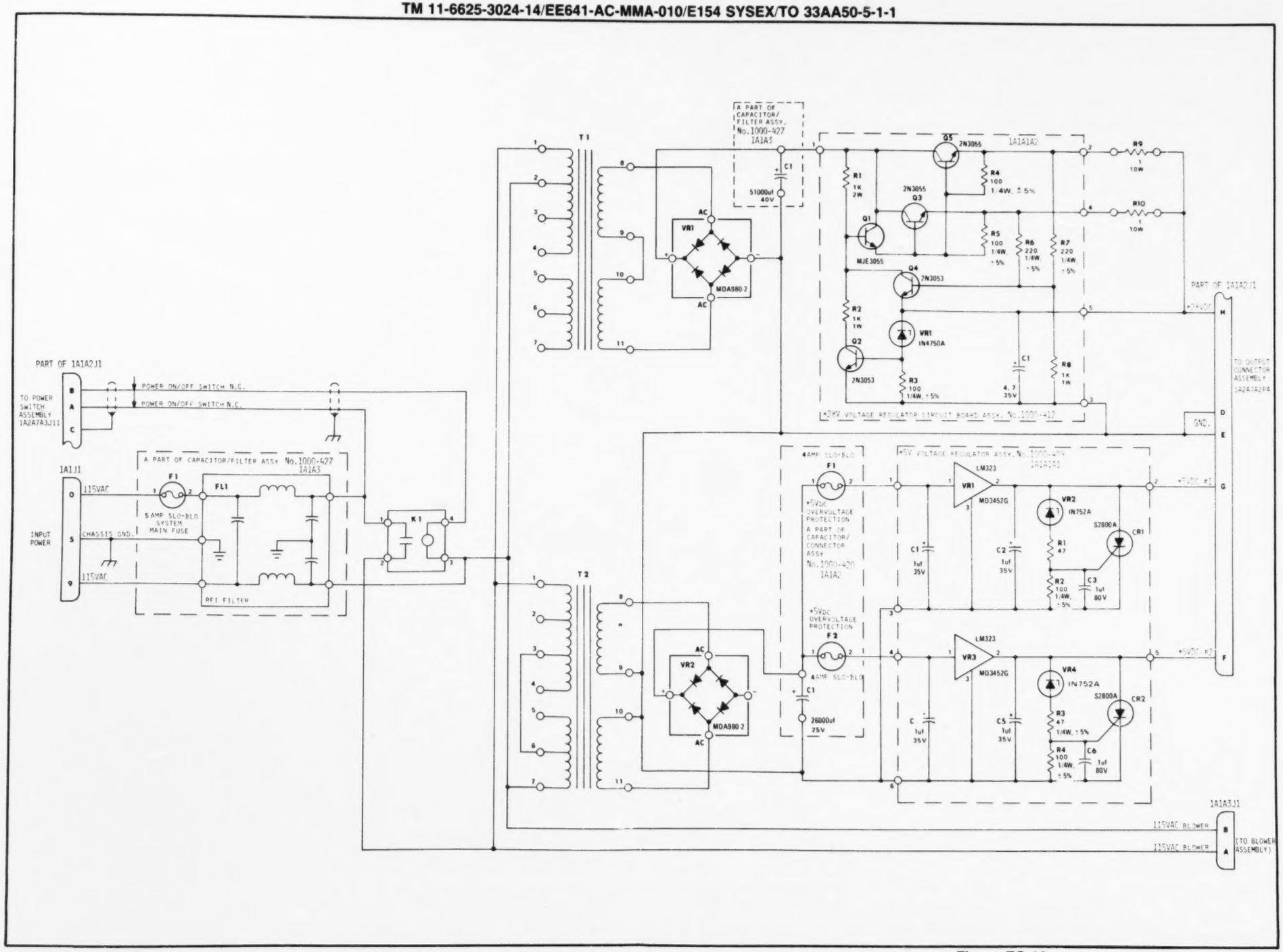
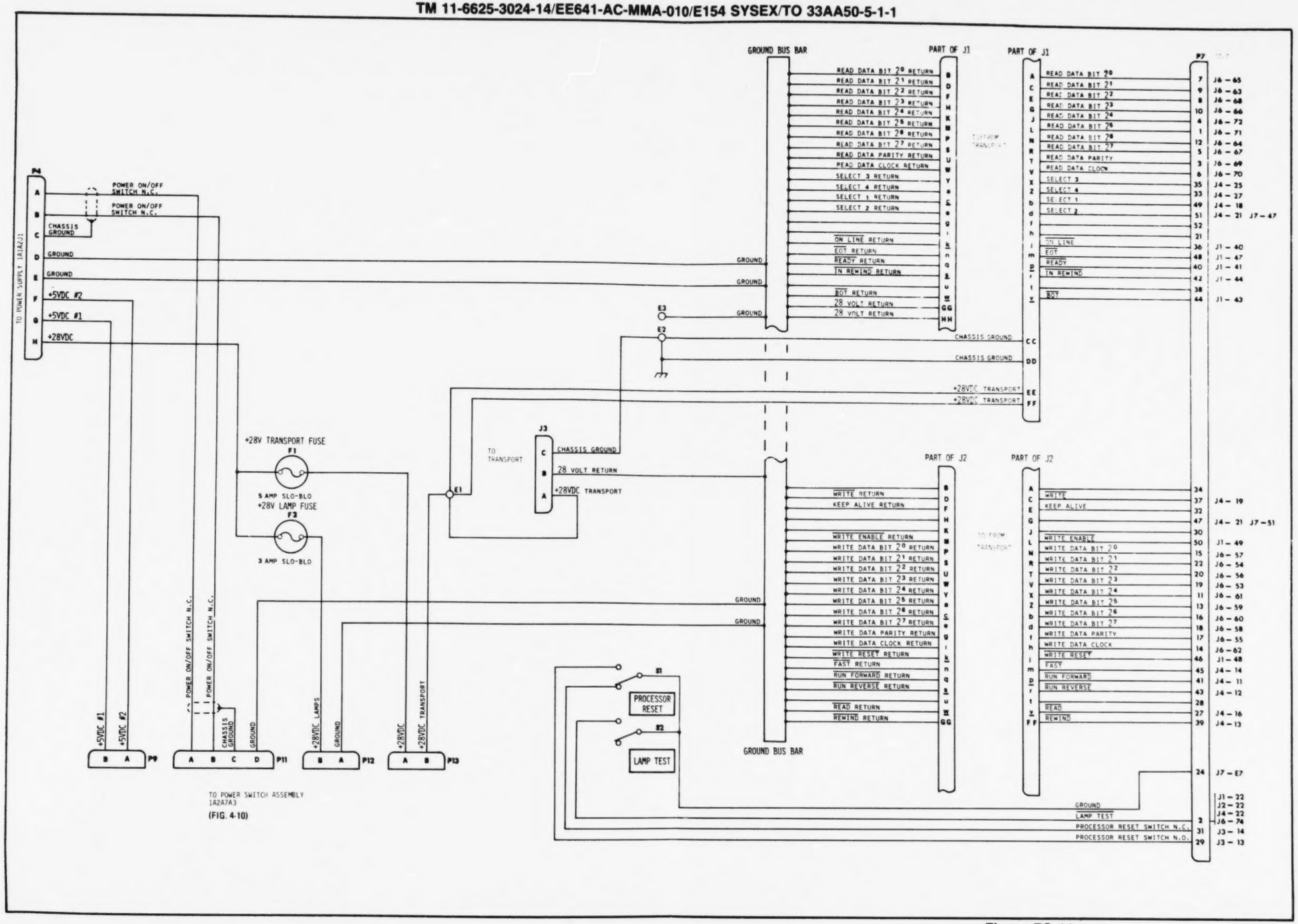


Figure FO-10.
Power Supply (1A1) Schematic



(FIG. 4-10)

Figure FO-11.
Output Connector Assembly (1A2A7A2) Schematic

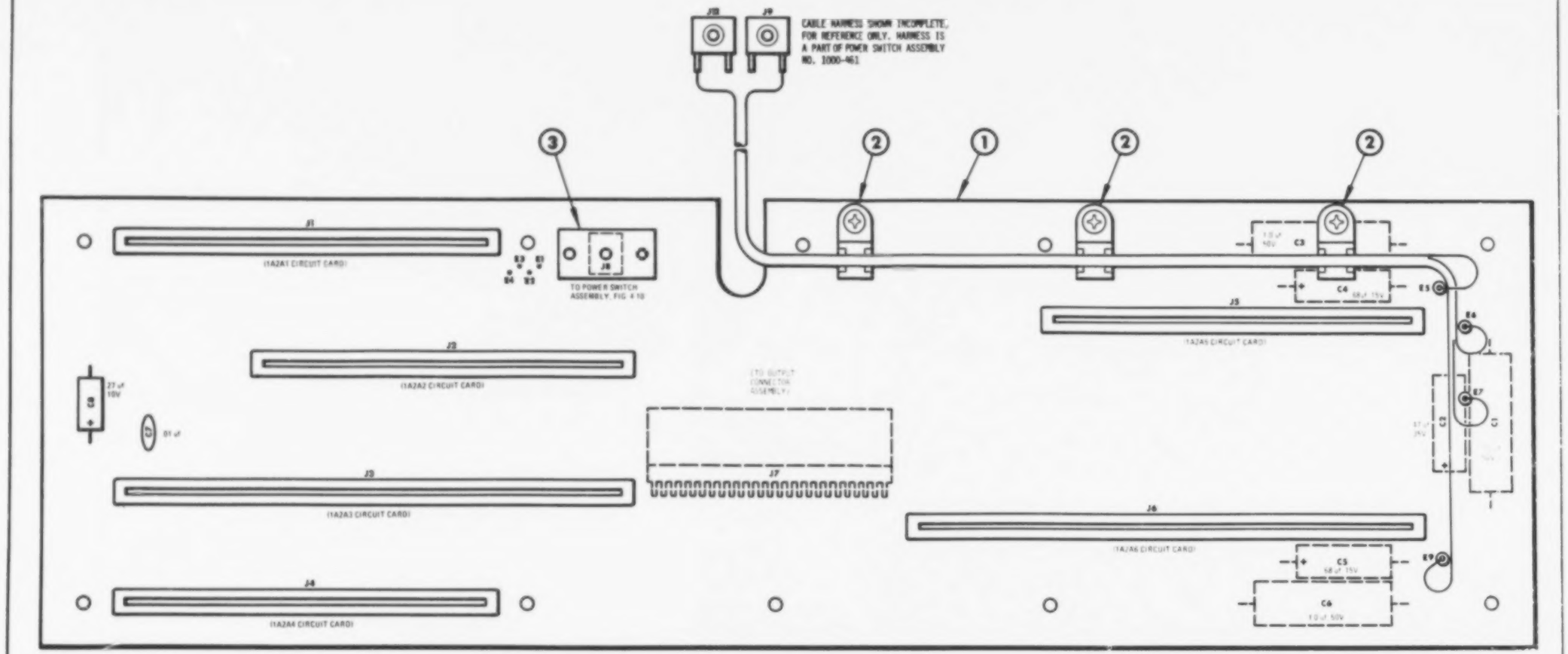


Figure FO-12.
Mother Board Circuit Board Assembly (1A2A7A1)

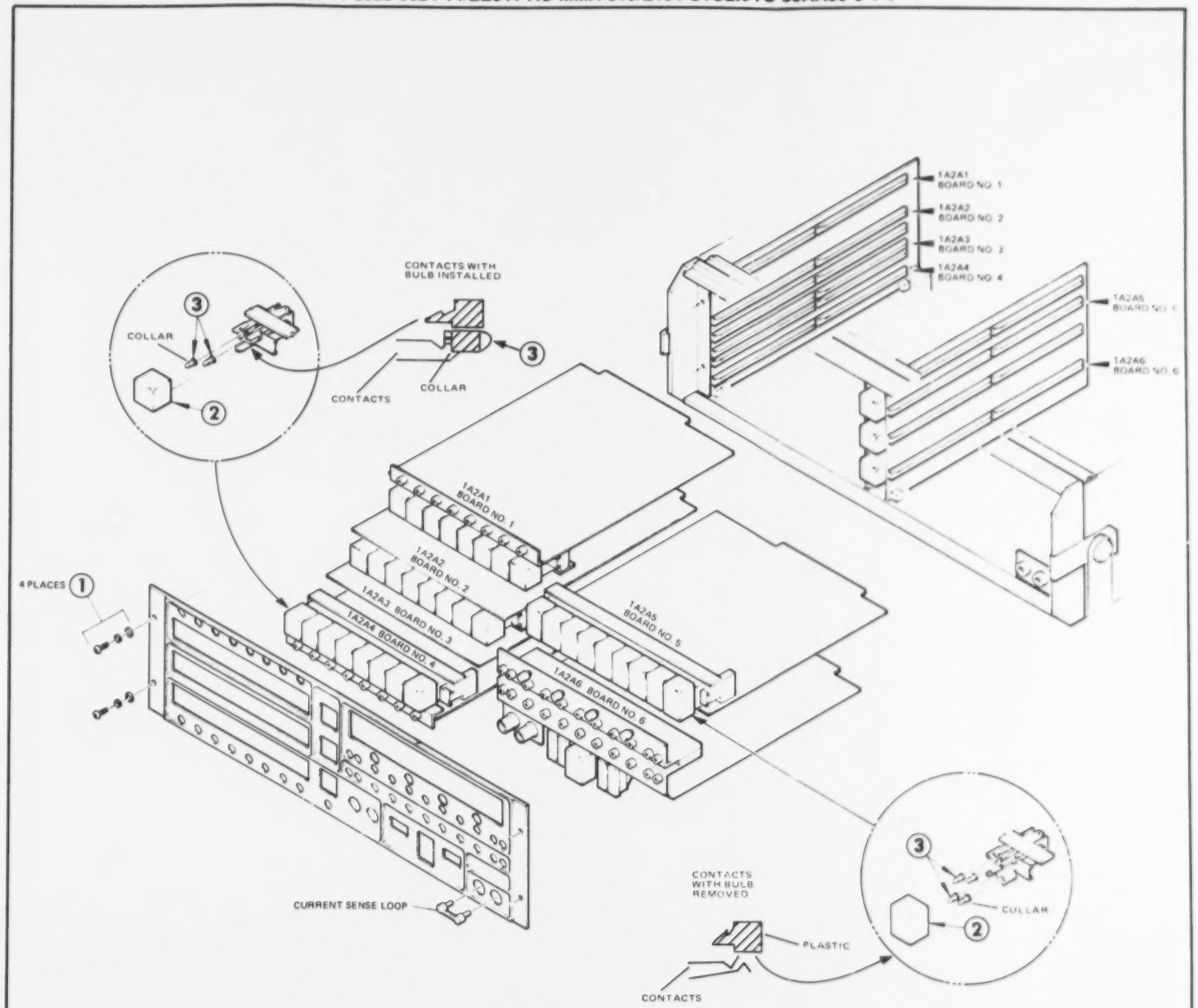


Figure FO-13.
Circuit Card Location

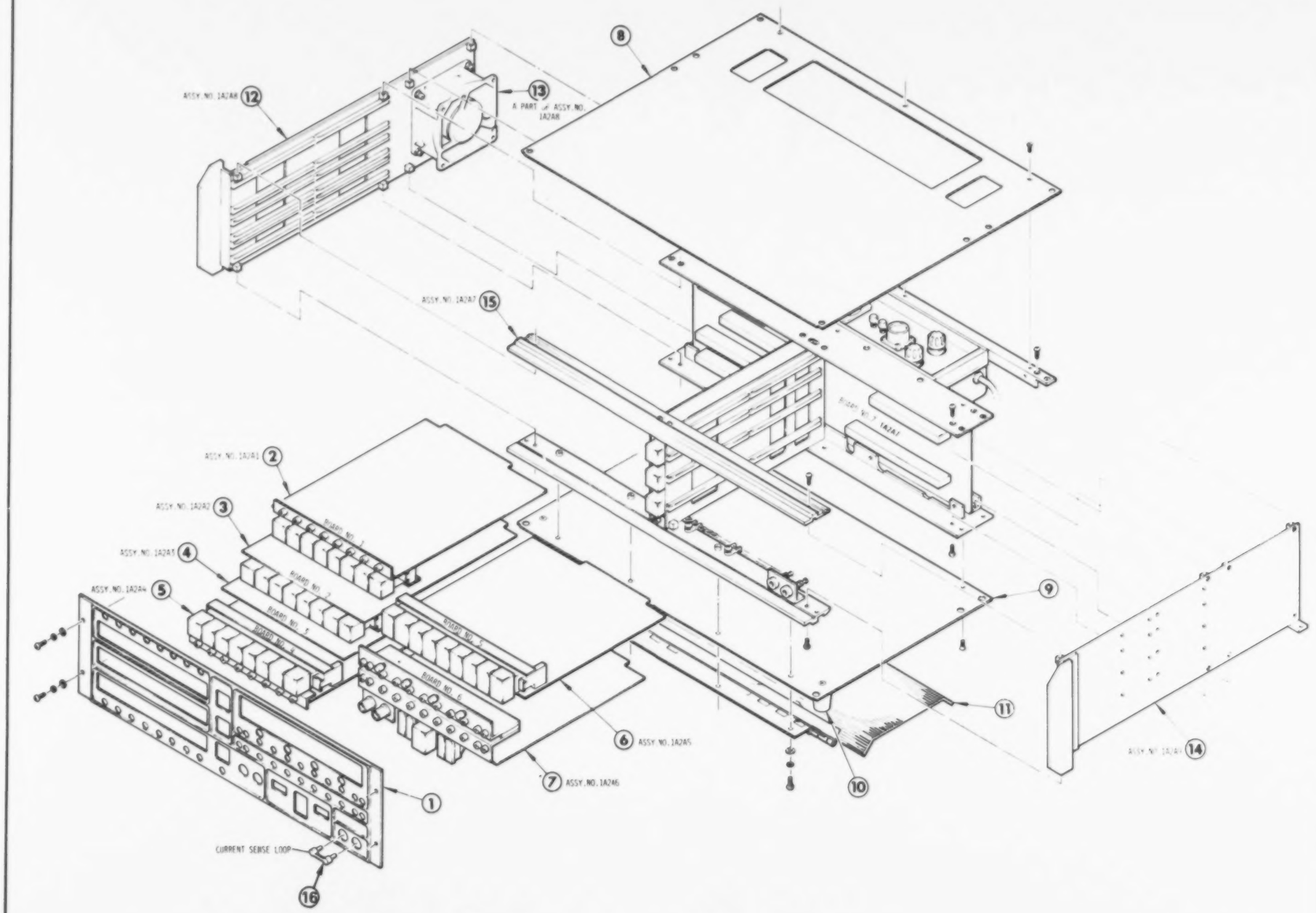


Figure FO-14.
Electronic Housing Assembly (1A2)

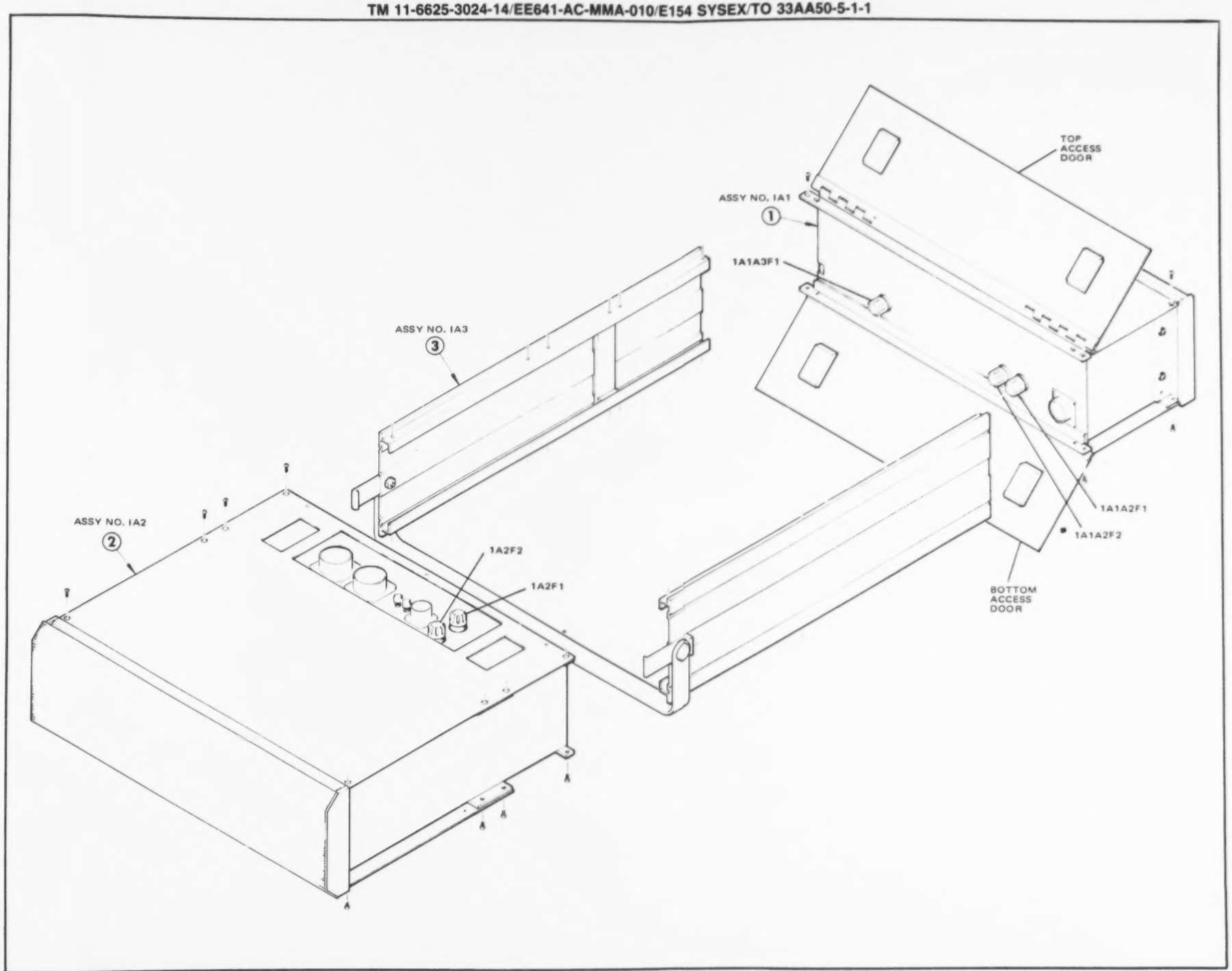


Figure FO-15.
Magnetic Tape Transport
Test Set Assembly (Unit 1)

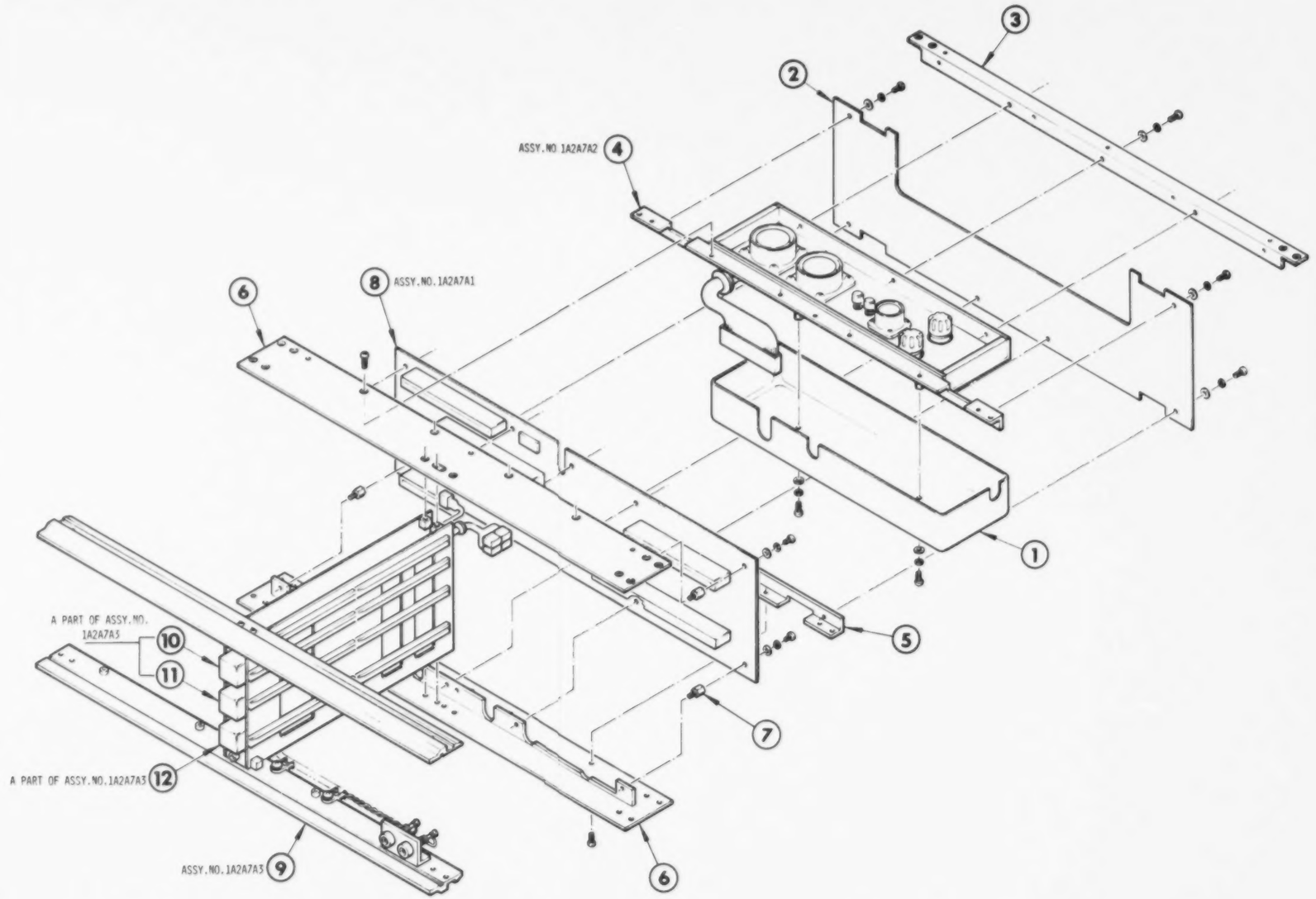


Figure FO-16.
Mother Board Assembly (1A2A7)